



Using human behaviour change interventions  
to improve the welfare of working equids in  
Colombia



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## Abstract

There are an estimated 116 million working equids that contribute to the daily lives of over 600 million people worldwide. These animals are used for a huge variety of income-generating and non-income generating activities including tourism, agricultural support, mining and transportation. Many of the families these equids support live below the international poverty line. The livelihoods of these individuals as well as the welfare of their equids is often compromised. Health conditions such as equine colic are common within working equid populations, and the consequences of poor welfare can be extremely severe within these populations. There are a number of national and international non-governmental organisations that aim to support the lives of working equids and their owners through a number of methods including provision of free veterinary treatment, advocacy, skills training and community participatory exercises. The lives of working equids are intricately linked with their owners and the wider communities. In order to appropriately support working equids, it is vital to develop a deeper understanding of the communities in which they live and the factors that contribute to their welfare.

The main aims of this thesis were to explore working equid welfare and the external factors that influence this across Colombia. Additionally, this research aimed to develop an evidence-based intervention aimed to improve the welfare of working equids in Colombia through the prevention of equine colic.

The first stage of this project investigated the impact of the Covid-19 pandemic on working equids and their owners across the world in order to identify any changes that may need to be considered. Following the Covid-19 pandemic, working equid owners reported experiencing intensified financial challenges including a reduced income and an increased cost of living. There was some impact on working equid care and welfare; however, these effects were less significant.

The second stage of the project involved 24 focus groups conducted with a range of stakeholders across eight communities in Colombia to explore the welfare of working equids and the factors that influence this. Thematic analysis identified four overarching themes: 'Testing external environment: "Surviving... is very hard"', 'Horse-human relationship: "Some owners have their horses in good condition... but others... tied up on a rope"', 'Cross-generational knowledge transfer: "We have to believe the elderly"', and 'Traditional management practices: "Fill a rucksack with wet ashes"'. The four overarching themes interact with each other, and all ultimately impact the welfare of working equids within the eight communities across Colombia.

The next stages of the project investigated equine colic within working equid communities in Colombia through a baseline survey and focus groups and workshops. The baseline colic survey highlighted high owner reported mortality and morbidity rates, and low levels of owner knowledge of the signs, causes and appropriate treatment methods of equine colic. The combined analysis from the focus groups and workshop identified three main themes: "*The streams dry up in the summer*": Managing accessibility, resources and tradition, "*Our faithful friend*": Encouraging desired change, and "*Take a wet toad, stick it to its belly and make the mule trot*": Current understanding and perceptions of equine colic. The first two themes explore the presence of barriers and facilitators specific to five working equid owning communities. The third provides an insight into current levels of knowledge and identifies existing community misconceptions. This will provide the starting point for information of colic to be built on. Methods to help improve owner knowledge were discussed throughout the focus groups. Face to face training was identified as the only appropriate methods across all communities.

The final phase of the project developed and evaluated an educational intervention. The development of the educational intervention used finding from prior chapters in this thesis along with existing literature. The educational intervention was evaluated through an owner longitudinal

survey, owner focus groups and qualitative questionnaires with the research team. There was an improvement in owner knowledge following the participation in the educational intervention. Analysis of focus groups with owners identified three overarching themes: 'Awareness and understanding of education content', 'Intention and development of ideas for change', and 'Evidence of and action towards behaviour change'. There was evidence that the education intervention was successful at improving owner knowledge of equine colic. It was also clear that there had been small changes in the right direction that could help to prevent cases of colic occurring within these working equid populations.

This research highlights the importance of understanding the context in which working equids and their owners exist and to ensure interventions are targeted and appropriate for the specific environment in which they will be delivered.

## Publications and Conferences

Wild, I., Gedge, A., Burrridge, J. and Burford, J., 2021. The impact of Covid-19 on the working equid community: Responses from 1530 individuals accessing NGO support in 14 low-and middle-income countries. *Animals*, 11(5), p.1363.

Villegas, S. H., Buitrago, J. D. R., Londoño, V. L., Gómez, C. J., Wild, I., & Freeman, S., Burrell, K., Burrridge, J., Burford, J., 2024. Impact of the SARS-COV-2 (COVID-19) pandemic on the welfare of working equids, Colombia 2021. *Journal of Agricultural Sciences Research*.

Burrridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2021). Perceptions on the replacement of working equids by mechanised vehicles in Colombia. *One Welfare World Conference*. Burgos, Spain (Virtual), September 15-16, p93-94,  
[https://www.onewelfareworld.org/uploads/9/7/5/4/97544760/proceedings\\_book.pdf](https://www.onewelfareworld.org/uploads/9/7/5/4/97544760/proceedings_book.pdf)

Burrridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2021). Impact of COVID-19 on working equids and their owners in Colombia. *One Welfare World Conference*. Burgos, Spain (Virtual), September 15-16, p117-118,  
[https://www.onewelfareworld.org/uploads/9/7/5/4/97544760/proceedings\\_book.pdf](https://www.onewelfareworld.org/uploads/9/7/5/4/97544760/proceedings_book.pdf)

Burrridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2022). Beer and Urine? Qualitative analysis of the treatment of common health problems seen within working equid populations in Colombia. *18th International Equitation Science Conference*. Hartpury University, UK, 9-12th August, p142, 2022. <https://www.equitation-science.com/2022-conference-proceedings>

Burrridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2023). Qualitative study exploring the social and physical

environment of working equids and their owners in Colombia. *One Welfare World Conference*. Burgos, Spain, 10-11<sup>th</sup> October, 2023.

Burridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2023). The impact of Covid-19 on working equids and their owners. *One Welfare World Conference*. Burgos, Spain, 10-11<sup>th</sup> October, 2023.

Burridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2023). A qualitative study exploring the factors influencing management and welfare of working equids in Colombia. *One Welfare World Conference*. Burgos, Spain, 10-11<sup>th</sup> October, 2023.

Burridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2024). Qualitative study exploring the barriers and facilitators to the prevention and management of equine colic in working equid communities in Colombia. *The 14<sup>th</sup> International Equine Colic Research Symposium*. Edinburgh, UK, 10-12<sup>th</sup> July, 2024.

Burridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2024). Exploring the knowledge and perceptions of equine colic within working equid communities in Colombia: A qualitative study. *The 14<sup>th</sup> International Equine Colic Research Symposium*. Edinburgh, UK, 10-12<sup>th</sup> July, 2024.

Burridge, J., Burrell, K., Villegas, S. H., Gómez, C. J., Wild, I., Freeman, S., Burford, J. (2024). Evaluation of an educational intervention aimed to improve the prevention and management of equine colic in working equid populations in Colombia. *The 14<sup>th</sup> International Equine Colic Research Symposium*. Edinburgh, UK, 10-12<sup>th</sup> July, 2024.

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*“Without my equid I am nothing”*



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## Table of Abbreviations

<b>ABBREVIATION</b>	<b>DEFINITION</b>
<b>CARE</b>	Committee for Animal Welfare and Ethics
<b>CBEA</b>	Community Based Equine Advisor
<b>COREQ</b>	Consolidated Criteria for Reporting Qualitative Research
<b>EARS</b>	Equid Assessment Research and Scoping
<b>EZL</b>	Epizootic Lymphangitis
<b>ICU</b>	Intensive Care Unit
<b>ICWE</b>	International Coalition for Working Equids
<b>IQR</b>	Interquartile Range
<b>MI</b>	Motivational interviewing
<b>NGO</b>	Non-governmental Organisation
<b>SDG</b>	Sustainable Development Goals
<b>TTM</b>	Transtheoretical Model
<b>UK</b>	United Kingdom
<b>UMATA</b>	Unidades Municipales de Asistencia Técnica Agropecuaria
<b>US</b>	United States

<b>INITIALS</b>	<b>NAME</b>	<b>AFFILIATION</b>
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<b>JHB</b>	John Burford	University of Nottingham
<b>KB</b>	Katie Burrell	University of Nottingham
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<b>DW</b>	Debbie Warboys	World Horse Welfare
<b>AG</b>	Amy Gedge	World Horse Welfare
<b>SH</b>	Santiago Henao Villegas	Universidad CES
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## Background Information

### **World Horse Welfare**

World Horse Welfare is a UK based international non-government organisation working with horses, horse owners, communities and governments to improve the welfare standards of equids in the UK and worldwide. World Horse Welfare work with local partner organisations and equid owning communities across 16 countries. Through working with partner organisations, it is possible to better understand the problems that working equids and their owners face. One country that World Horse Welfare work in is Colombia.

### **Fundación Arrieros Colombia**

Fundación Arrieros Colombia is a non-profit organisation based in Medellin, Colombia who have been working alongside World Horse Welfare since 2018. Fundación Arrieros Colombia carry out educational project with children and young people, delivery training programmes to those directly or indirectly involved within working equids, run animal welfare certification and community outreach programmes, design and implement research projects and run health brigades.

Health brigades are conducted in a number of communities, during which staff and students provide working equid owners with free basic veterinary treatment. During health brigades all equids will receive anthelmintic treatment. Owners will have the opportunity to ask trained veterinary professionals for advice regarding a range of equid health problems, and where available equids will be treated. Treatment may include disinfecting and treating wounds, administering pain medication, and fluid therapy.

### **Universidad de CES**

Universidad de CES is a university based in Medellin, Colombia. CES has been working alongside Fundación Arrieros Colombia, World Horse Welfare and The University of Nottingham since 2018. Students studying veterinary

medicine as CES are given the opportunity of volunteering with Fundación Arrieros Colombia during their visits to working equid owning communities.

## Glossary

TERM	DEFINITION
<b>AGROVET STORE</b>	Store selling a number of veterinary medical supplies (along with other products used in agriculture) including medication. This can often be purchased without a prescription.
<b>AGUA PANELLA/ HONEY WATER/ SUGAR WATER/ MOLASSES WATER</b>	Panella is unrefined sugar cane typical in Latin America. Agua Panela refers to panela dissolved in water. This is a common drink for humans and is often given to working equids. Molasses dissolved in water is also often given to working equids. This is also sometimes referred to as sugar-water or honey-water.
<b>CHIVA</b>	Public bus used across rural Colombia.
<b>GUAGUA (CANICULUS PACA)</b>	Large rodent found in Latin America.
<b>HORMIGUILLO</b>	White line disease
<b>MOGOLLA</b>	A type of grain often fed to equids. This can also be added to water (mogolla water) and offered to equids.
<b>MULETEER</b>	An individual who works with mules. This refers to a more traditional role, which can be different from the animals owner.
<b>UNIDADES MUNICIPALES DE ASISTENCIA TÉCNICA AGROPECUARIA (UMATA)</b>	A governmental body providing technical assistance to farmers.



# 1 Literature review

## 1.1 Working equid overview

Throughout this thesis the term working equid refers to donkeys, horses and mules that contribute to the daily livelihoods of their owners and the wider communities. These animals are used for a huge variety of activities including tourism, agricultural support, mining and transportation, and often play a vital role in the financial stability and overall livelihood satisfaction of the their owners (Valette, 2015, Valette, 2014a). There are estimated to be around 116 million working equids globally (Allan, 2021). It is likely that the working equid population is much larger than this due to the lack of inclusion of these animals in official figures (Allan, 2021).

Working equids are estimated to make up around 92% of the global population of equids (Bonsi *et al.*, 2023a); however, research, support and legislation rarely consider them (Valette, 2014b). Instead, efforts are often focused on competition, pleasure and companion horses and donkeys within developed countries such as the United States and the United Kingdom. This leaves the lives of these equids and their owners largely unknown and poorly supported.

Horses, mules, and donkeys are all members of the *Equidae* family. Equids have been domesticated for over 5000 years (Vilá *et al.*, 2006, Kimura *et al.*, 2013, Warmuth *et al.*, 2012) and can be seen as companion, working or sport animals across the world. Horses, donkeys and mules play an important role in millions of individuals lives (Lönker *et al.*, 2020). In some parts of the world working equids contribute even more considerably to the lives of their owners and the wider communities. The large majority of equids are found in low- and middle-income countries where many of these animals will be counted as 'working equids' (Burn *et al.*, 2010a). Working equids are incredibly versatile, they are found all around the world and used for a huge range of activities. Whilst many of the challenges these animals face will be

similar to other equine populations, other challenges will be more specific to the working equid environment.

## 1.2 Working equid owners and their communities

### 1.2.1 The importance of working equids to the lives of their owners

It is estimated that working equids support at least 600 million people globally (Sommerville *et al.*, 2018) in various sectors including mining, agriculture, tourism, public transport and construction (Grace *et al.*, 2022, Valette, 2015). In a survey conducted by Wild *et al.* (2021b), transportation of crops and other associated materials was the most common use of working equids across Latin America and Asia. Conversely, the same study found that working equids were a popular mode of transportation for people, and a means of water collection, in Africa. Though limited to 14 countries, this study highlights the versatility of working equids worldwide.

It is widely acknowledged that working equids have a significant positive influence on the lives of their owners (Hassan *et al.*, 2013, Geiger *et al.*, 2020, Dijk *et al.*, 2011). These equids often provide their owners with financial stability (Haddy *et al.*, 2021b, Starkey, 2011, Maichomo *et al.*, 2019). This can be directly or indirectly; either through facilitation of other forms of income generation or due to reduced household outgoings (Valette, 2015).

There are a number of income generating benefits of working equids (Maggs *et al.*, 2021). Whilst the uses of working equids and therefore the forms of income-generation differ between countries, communities and individual owners, there is no doubt that the financial benefits of these animals is significant.

Maggs *et al.* (2021) used a mixed-method approach to conduct surveys, interviews, and focus groups with 262 participants in Ghana. The authors identified six areas of financial benefit derived from donkey ownership: domestic defined as saving costs with no direct financial gain, direct hire which had the potential earnings of the equivalent of £1.40-£2.80 per hire,

speculative selling such as collecting wood to sell to anyone (without a specific buyer pre-determined), speculative collection for example collection of wood to sell commercially to specific pre-determined buyers, donkey intestine soup which was reported in one region in Ghana during which women would collect donkey intestines from slaughterhouses to make and sell soup, and freeing time which would allow owners to seek other forms of employment. Some of these financial benefits such as selling donkey intestine soup are more community specific, whilst others such as renting equids have been seen elsewhere. A study of 120 households across three regions in Ethiopia highlighted the direct income derived from working equids by renting of their animals (Geta, 2015). Admassu and Shiferaw (2011), explored the uses of working equids across Ethiopia and reported a number of income-generating activities that working equids were used for. The uses of working equids varied slightly depending on the species of equid. Donkeys were used for pack services, cart use, renting, breeding or trade; horses for riding, horse-drawn taxis, pack services, breeding and renting out; and mules for riding, pack services, renting out and horse-drawn taxis. These studies highlight the vast range of activities working equids are used for across the world.

Working equids provide their owners and their families with a level of financial stability that would otherwise not be possible (Valette, 2015, Admassu and Shiferaw, 2011). The importance of equids in this setting is often very clear; however, indirect financial benefits can also have a significant impact on the livelihoods of working equid owners.

A large number of working equid owners work within the agricultural sector; on small scale farms where the support of their equids are used for is invaluable. Existing studies have shown that equids are used to assist all aspects of farming, from ploughing (Arriaga-Jordán *et al.*, 2005) to firewood collection and crop transportation (Wild *et al.*, 2021a). Though not a direct source of income themselves, the use of working equids during these activities is essential (Valette, 2015).

In some cases, working equids can provide essential support to their owners who may not be able to afford a motorised alternative. For example, one study found that some owners are unable to afford a tractor; however, they are able to purchase an equid and will consequently rely on that equid to plough their crops (Haddy *et al.*, 2020b).

Along with financial benefits, equids contribute to the day to day lives of owners in various ways, including personal transport for those living within more rural communities which would otherwise be at a cost to the owners and their families (The Brooke, 2021). This can help further improve owner livelihoods by increasing physical access to education (Costa Rica Equine Welfare, 2023), health care (International Coalition of Working Equids, 2023, Admassu and Shiferaw, 2011) and clean water (International Coalition of Working Equids, 2023). Admassu and Shiferaw (2011) reported that in Ethiopia working equids would occasionally be used at festivals and funeral services. Other studies reported the use of donkeys to move furniture and musical instruments for community events and celebrations (Maggs *et al.*, 2021).

Many working equid owners acknowledge the importance of their animals and express love and care for them, associating them with words such as 'friendly', 'sweet', 'calm' and 'brave' (Haddy *et al.*, 2020b). Owners felt their equids were highly valued with some stating that they did not know how they would work without an equid (Haddy *et al.*, 2020b). In some cases a sick equid or the loss of an equid can have major consequences (Valette and Upjohn, 2014). With the importance of these animals clear it is unsurprising that studies conducted in Ethiopia, Kenya, India and Pakistan have found owners often rank their equids as their most important livestock (Valette and Upjohn, 2014).

#### 1.2.2 Family structure within working equid owning communities

In some countries research has demonstrated a gendered difference to the activities undertaken by men and women (Maggs *et al.*, 2021). In Northern

Ghana, men would often be involved in income-generating seasonal activities, whereas women often worked with equids to complete daily tasks that did not generate any income (Maggs *et al.*, 2021). Women play a significant role in caring for working equids in Ethiopia, Kenya, India and Pakistan; however, many women feel they lack access to equine specific knowledge and skills training (Valette and Upjohn, 2014). Women are responsible for many equine husbandry activities including stable cleaning and management, feeding, harness maintenance, equid first aid (including eye cleaning and wound care) and occasionally grooming (Valette and Upjohn, 2014, Abbas, 2014, Ali *et al.*, 2014). Women are also involved in deciding if a sick equid should work or rest and in deciding on treatment options in Pakistan and India (Abbas, 2014, Zaman *et al.*, 2014). A qualitative study conducted by Zaman *et al.* (2014) explored the use and benefits of working equids to the lives of 78 women across seven regions in India. Women reported that equids were important for financial benefit through transportation of construction materials and goods, and non-income generative activities including the transport of animal feed and as an ambulance. Women reported that owning an equid meant that their living and livelihood was guaranteed. Women were reported to be the main decision makers and carers for equids within these communities. Whilst this study was only conducted in India and therefore the findings may not be generalisable to other countries or communities, the authors concluded that equids are significant in the lives of women which has been reflected in other studies across other working equid owning communities.

Ownership of a working equid also gives women an opportunity to access a reliable and disposable income that is consistently available throughout the year. The income generated by working equids is used for household goods, food, school fees and healthcare. This financial support is further benefited by more indirect financial benefits such as reduced outgoings, for example, for transport (Valette and Upjohn, 2014). The importance of working equids to the daily lives of women was highlighted in studies across Kenya, Ethiopia, India and Pakistan, and Portugal and Spain (Valette, 2014a, Haddy *et al.*,

2020b). This can be through help with household chores, elevation of community status and provision of a reliable income (Valette and Upjohn, 2014). Working equids reduce the burden placed on women by helping with household chores including transporting goods to market, animal feed to other livestock and construction materials for personal use. The reduced amount of time required to carry out daily tasks provides women with more opportunities to spend time with children and elderly relatives (Valette and Upjohn, 2014). Improved health can also be seen amongst women who own one or more working equids as they are no longer required to carry heavy loads themselves and so experience fewer health problems (Valette and Upjohn, 2014, Abbas, 2014). Working equids provide support for other livestock by carrying water and fodder to other animals (Abbas, 2014). The income from working equids is also used to buy medications for other livestock (Valette and Upjohn, 2014).

Working equids support women in carrying out social functions and increasing their status and opportunities within the community. Women who own working equids can form groups which elevates status within the community based on skills and knowledge. In some communities, the ability to lend an equid to others in times of need elevates the individual's respect (Valette and Upjohn, 2014).

Only a handful of research studies have focused on the relationship between women and working equids. Whilst there are a range of countries that this research has focused in, including Kenya, Ethiopia, India, Pakistan, Portugal, Spain, Mexico and Ghana, these studies still focus on confined populations of working equid owners. Research that is not explicitly exploring gender specific factors often include predominantly male participants, with previous studies conducted in Ethiopia highlighting that women were more reserved and less willing to participate in interviews with male researchers (Curran *et al.*, 2005). However, the importance of including women in working equid research has been made clear and future research should consider methods to increase female inclusion.

### 1.2.3 External environment of working equid owning communities

The large majority of working equids live and work within low- and middle-income countries (FAOSTAT, 2022). Whilst working equids often increase an individual's earning potential and provide a way out of extreme poverty (Kubasiewicz *et al.*, 2022), many owners are still living below the poverty line and are considered vulnerable (Lanas *et al.*, 2018).

Extreme poverty is concentrated in sub-Saharan Africa, areas of high conflict, and rural areas, all of which are home to a large number of working equids. Individuals living below the poverty line are likely to experience health inequalities as a result of their socioeconomic status (World Health Organization, 2018), along with poor access to education, housing, sanitation, food, and clean water (The World Bank, 2020b).

Studies have found up to 67% of families relying on working equids in Colombia live in poverty and 48% live in extreme poverty (Burford, 2019); with poverty being defined as earning less than US\$1.90 per family member per day and extreme poverty being defined as earning less than US\$1.30 per family member per day (The World Bank, 2021b). Since the study conducted by Burford (2019), the global poverty definition has changed from US\$1.90 to US\$2.15 due to the increased cost of basic food, clothing and shelter in low income countries across the world (The World Bank, 2022a). However, this nominal change has not impacted the global poverty rate as the real value of international poverty remains virtually unchanged, with goods and services that would have previously cost US\$1.90 in low-income countries now costing US\$2.15 on average. The global poverty definition is likely to change in the future with further changes to costs of goods and services.

The context of working equid owning communities is relatively unknown. However, many working equid owners are likely to experience the challenges associated with poverty in low- and middle-income countries. Whilst global poverty had been steadily declining for decades, 2020-2022 saw an increase in poverty and highlighted the loss of progress as a result of the Covid-19

pandemic (The World Bank, 2022b). However, research investigating the impact of the global pandemic on working equids and their owners is lacking.

#### 1.2.4 Covid-19

A global pandemic was declared on 11 March 2020 following the rapid spread of SARS-CoV-2 [COVID-19] (World Health Organization, 2020). The spread of this disease resulted in serious health issues and the death of millions of people, as well as secondary socioeconomic implications (World Health Organization, 2021, Nicola *et al.*, 2020). Global responses to the Covid-19 pandemic included enforced border closures, travel restrictions and quarantine (AlJazeera, 2020, Public Health England, 2020, Hale *et al.*, 2020); which consequently has had global economic impacts (Harari *et al.*, 2021, Naseer *et al.*, 2023).

Vaccination and increased testing provided a 'way out' in some countries ; however, many low- and middle- income countries had restricted access to testing and vaccination supplies and equipment (Dyer, 2021, Figueroa *et al.*, 2021b, Berkley, 2021). With poorer countries having experienced fewer immediate solutions, the long-term consequences were expected to be intensified. It is estimated that 75-95 million people will have been pushed into extreme poverty (defined as earning less than US\$2.15 per person per day) as a result of the pandemic (The World Bank, 2022b, Mahler *et al.*, 2022). Following the onset of the pandemic, global inequality rose, with the world's poorest individuals and communities experiencing the most significant income losses (Gagnon *et al.*, 2023). Along with this, many of these individuals experienced severe setbacks in terms of health care and education (The World Bank, 2022b). With such a large proportion of working equid owners living below the international poverty line before the onset of covid, it is important to monitor these individuals as the consequences of the pandemic are likely to have been significant.



### 1.2.5 Working equids and the wider world

The importance of working equids goes beyond that of the individual owners and local communities. These animals play a vital role in the development of human society across the world. The United Nations Sustainable Development Goals (SDGs) aim to achieve a better future. These 17 goals address the biggest global challenges and relate to poverty, inequality, climate change, environmental degradation and peace (Sustainable Development Goals, 2016)[Figure 1].



# SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



Figure 1: The United Nations Sustainable Development Goals (SDGs) aim to achieve a better future. These 17 goals address the biggest challenges being faced globally and relate to poverty, inequality, climate change, environmental degradation and peace (Sustainable Development Goals, 2016).

Working equids play a vital role in strengthening livelihoods and as a result contribute to SDGs 1 (No Poverty) and 8 (Decent Work And Economic Growth). For many individuals living in low- and middle- income households, working equids can provide owners with up to 80% of their total household income (Doumbia, 2014, Arriaga-Jordán *et al.*, 2005, Admassu and Shiferaw, 2011, Kandpal *et al.*, 2014). Working equid owners in Mali have reported that they are financially more resilient than individuals within their communities who do not own working equids (Doumbia, 2014). The financial contributions of working equids could help reduce the rate of poverty across the world.

Beyond financial stability working equids can help work towards SDGs 3 (Good Health And Well-Being) and 6 (Clean Water And Sanitation). Working equids support families across the world to access vital resources. Millions of individuals, mainly women and girls, spend hours every day collecting clean water for their families and their livestock (UNICEF, 2016). The use of working animals can provide a feasible option for millions of families to access water without the major physical burden of having to carry it themselves; for example, studies conducted in Mauritania identified the use of donkeys for pulling water carts containing up to 400 litres to distribute across towns and villages due to the lack of sufficient water systems in place (Ouassat, 2007, International Coalition of Working Equids, 2023). Access to human medical care is also facilitated by working equids (Bonsi *et al.*, 2023a).

SDG 2 (Zero Hunger) and 12 (Responsible Consumption And Production) can be improved through the use of working equids, with equids providing owners with vital income to pay for food, along with providing transport to owners making the physical access to food easier. Small farmers produce the majority of food within low and middle income countries, and most farms rely heavily on working equids to produce and transport crops and livestock products (Arriaga-Jordan *et al.*, 2007, Pritchard *et al.*, 2018, Dijk *et al.*, 2011). For example, owning two equids could represent up to US\$412.50 yearly income for smallholder farmers in Mexico (Arriaga-Jordán *et al.*, 2005).

The role of working equids in SDG 5 (Gender Equality) is clear, with women heavily relying on equids for support on a daily basis (Vasanthakumar *et al.*, 2021, Valette and Upjohn, 2014, Upjohn and Valette, 2014). Along with this, the increased access to education resulting from working equid ownership can help to improve SDG 4 (Enabling Education) dramatically.

Climate change is a major concern for the planet. Working equids provide draft power across the world and have significantly less impact on the climate in comparison to motorised vehicles. The use of animal traction can help mitigate the consequences of utilising fossil fuels in agriculture, and therefore targets SDG 13 (Climate Action).

### 1.3 Management and welfare of working equids

There are many ways to evaluate animal welfare, and it is often far more complex than anticipated. Many components contribute to the welfare of an animal (Mellor, 2016, Duncan and Dawkins, 1983). It is widely accepted that that one aspect of sufficient animal welfare requires that animals have access to water, food and shelter (Mellor, 2016). Another major aspect of welfare is physical health of an animal and the absence of disease, injury and physiological stress responses (Mellor, 2016). There are a number of welfare assessment approaches used to evaluate equine welfare (Hockenull and Why, 2014). Welfare assessments used for working equid welfare often include a broader range of welfare parameters with some involving additional behavioural responses to human interactions (Burn *et al.*, 2010b). More recently, the Equid Assessment, Research and Scoping (EARS) tool was developed to increase the ease of using assessment tools across different contexts (Raw *et al.*, 2020). There are 19 welfare indicators included in the EARS tool ranging from environmental information including weather conditions and water availability, to behaviour and health status. The standardisation of welfare assessments such as this are vital to allow comparisons to be drawn across equid populations.

Inadequate nutrition and water access is a common issue within working equid populations. This is a welfare concern on its own, but will also predispose equids to a range of health problems including equine colic (Curtis *et al.*, 2019). Many working equids are fed inadequate feed, resulting in hunger and low body condition scores (Alam *et al.*, 2016, Singh, 2021).

### Equine nutrition

Nutritional practices within working equid population varies. Haddy *et al.* (2021b) conducted questionnaires with 120 working equid owners in Mexico and assessed the welfare of their equids [56 donkeys, 7 mules and 57 horses](Haddy *et al.*, 2021b). The frequency of feeding varied within this study, with most owners either feeding their equids once to twice a day (49%), or three to four times per day (20%). Fifty-three percent of equids were reported to never have access to grazing. Equids living in regions with a dryer environment had the poorest overall welfare, which authors associated with the lack of, or poor quality, forage available within these areas. This study was conducted at one point within the year and therefore it was not possible to identify any impact that seasonal variation would have on equid welfare. With forage quality and quantity likely to vary throughout the seasons, the outcomes from this study may have differed depending on when it was conducted. Irrespective of this it is concerning that a large proportion of working equids had no access to grazing, which is a vital component for all equid health (Ralston, 2022).

Owners may lack the knowledge and understanding of appropriate equine nutrition, as well as experiencing difficulties with physically accessing the resources needed to provide their animals with sufficient feed. Due to financial and logistical constraints working equids may not receive nutrient complete concentrate feeds or sufficient grazing opportunities (Upjohn and Wells, 2018). Long working hours and demanding work targets may be in place in some work environments such as brick-kilns (Shah *et al.*, 2007). In these situations, owners may have little control over the daily routine of their

equid and time for sufficient grazing may not be available. Pica and scavenging behaviours have also been reported in working equid populations (Upjohn and Wells, 2018) and can cause potentially fatal intestinal obstructions. In urban areas, grazing may be limited or non-existent. In rural areas, grazing may also be restricted due to work hours, a lack of owned or common land, hobbling or tethering used to reduce risk of equid straying, and weather or climate including drought (Upjohn and Wells, 2018).

### Water management practices

Access to water is vital to the survival and welfare of all animals. Many working equids may have access to limited or dirty water facilities (Shah *et al.*, 2007, Norris *et al.*, 2020, Haddy *et al.*, 2021b, Haddy *et al.*, 2020b). One study conducted in Ethiopia assessed 600 equids and interviewed 60 owners (Mekuria *et al.*, 2013). Fifty-two percent of equids were underweight. Owners reported that equids were offered water two (42%) or three (53%) times a day with equids being offered an average of 5.75L of water each time. With the recommended volume of water consumed per day for a sedentary horse being five litres per 100kg bodyweight (Ralston, 2022), the volume of water being offered in this study may not be sufficient. Another study conducted in Mexico highlighted that 59% of equids had no access to water throughout the working day (Haddy *et al.*, 2021b). Another study in Honduras found that only 45% of equids had free access to water throughout the day (Wild *et al.*, 2021a). Wild *et al.* (2021a) found that 51% of equids were given water directly from a river, and 42% from a well. This study relied on owner reported data through semi-structured verbal questionnaires with 93 owners.

Insufficient provision of water to working equids may be due to the environment they live in, or as a result of their owner's choices. Owner perceptions and traditional views including those associating water provision with equine colic (Upjohn and Wells, 2018), and those believing that providing donkeys with water can be fatal (Lewa *et al.*, 2007) can exacerbate the problem. Dehydration is a major concern, and can result in weakness, a

reduced capacity to work and increased risk of collapse (Upjohn and Wells, 2018).

### Shelter provision and ventilation

Well-ventilated shelter is crucial to ensure equids are protected from direct sun, extreme heat, cold, wind, rain or snow (Upjohn and Wells, 2018). Due to a lack of priority and knowledge by authorities and owners, equids may end up spending extended hours in direct sun, extreme temperatures and poorly ventilated spaces, resulting in increased risk of heat stress, dehydration and health problems such as respiratory disease (Shah *et al.*, 2007). Shah *et al.* (2007) explored the impact of working hours, housing and water provision on the welfare of 524 equids working in brick kilns in Pakistan. This study used a survey to collect data, with assessment of equid housing including observation of ventilation, hygiene and water facilities. Within this survey the average body condition score for horses and donkeys was 1/5 on a scale in which 1/5 referred to very thin and 5/5 referred to very fat. The authors concluded that there was a significant association between the body condition score of the equid and the water provision and ventilation within the housing system. Shah *et al.* (2007) suggested that appropriately managed housing systems could improve an equid's overall condition and increase their working ability.

### Handling and management skills

Working equid owners may lack basic handling and management skills and knowledge which in turn can result in fear responses and pain (Upjohn and Wells, 2018). Practices such as beating or whipping equids has been seen within working equid owning communities and can result in lesions and mental distress (Swann, 2006, Aluja, 1998). A study conducted in Nepal used welfare frameworks (Welfare Aggregation and Guidance, and Equid Assessment, Research and Scoping tool) to investigate the welfare of 2448 equids across 41 brick kilns (Norris *et al.*, 2020). Observations during the

assessment including owners using rough handling techniques including slapping, hitting and yanking at their working equids (Norris *et al.*, 2020). These negative handling methods may in turn elicit negative behaviours from the equid that encourage owners to further whip or beat their animals (Iqbal *et al.*, 2007).

### 1.3.1 Common conditions seen in working equid populations

The welfare of working equids is often compromised, with conditions such as lameness (Merridale-Punter *et al.*, 2022), colic (Stringer *et al.*, 2017, Wild *et al.*, 2021a) and wounds (Haddy *et al.*, 2021b) being both frequent and severe.

#### Lameness

Lameness refers to changes in normal gait or stance in equids. This is usually caused by pain, however, lameness can be caused by mechanical abnormalities. Lameness caused by abnormal changes in musculoskeletal structures and can be due to a range of factors including trauma, repetitive stress, and endocrinological changes (Adams, 2022). As such, lameness is a common health concern for equids across the world and has significant implications for performance and welfare for both competition and companion horses (Dyson, 2002, Ireland *et al.*, 2013, Jönsson *et al.*, 2013) and working equid populations (Bazezew *et al.*, 2014, Kiros *et al.*, 2016, Reix *et al.*, 2014, King *et al.*, 2009, Ali *et al.*, 2016a).

In India and Pakistan, one study used trained observers to conclude that of 227 working horses, 98% showed gait abnormalities and 87% scored 3 or 4/ 4 (where 1= sound and 4= non-load bearing) in at least one limb (Broster *et al.*, 2009). All horses in this study showed chronic foot pathology, 94% showed chronic joint disease and 83% had digital flexor tendonitis (Broster *et al.*, 2009). Whilst this highlights the potential significance of lameness within working equids, this study only considered small populations across two regions, and it is unlikely that this study can be generalised across other countries and populations. Lameness assessment can be extremely subjective



in any setting, even amongst experienced professionals (Hammarberg *et al.*, 2016) which can make identifying accurate rates of lameness challenging.

Merridale-Punter *et al.* (2022) conducted a systematic review and meta-analysis of 64 studies investigating lameness in working equid populations across 18 countries, and reported a pooled prevalence of lameness of 30% and gait abnormalities of 63% of working equids (Merridale-Punter *et al.*, 2022). High levels of study heterogeneity were described resulting from variations in equid populations, and context-dependent factors. The prevalence of lameness in the systematic review and meta-analysis varied from 3% (Morgan, 2007, Shelima *et al.*, 2007) to 100% (Reix *et al.*, 2014). Most of the studies included in this systematic review reported data in single countries. With the vast variation between working equid populations in terms of everything from workload and type of work to the climate they live in, it is unsurprising that the results from each study vary and are not representative of all working equid populations.

Co-morbidities often seen in conjunction with lameness in working equid populations include low body condition scores and poor conformation identified in 102 working donkeys in Pakistan (Reix *et al.*, 2014), the presence of skin lesions and heavy cartloads in 450 mules in Ethiopia identified through a survey and lameness exam (Ali *et al.*, 2016a), and cart condition and driver inexperience as determined in a population of 390 mules in Ethiopia (Bazezew *et al.*, 2014). A seven-day working week is a common occurrence within some working equid populations including those in Ethiopia and Mexico (Ali *et al.*, 2016a, Bazezew *et al.*, 2014, Haddy *et al.*, 2021b) which has been linked with an increased risk of lameness (Merridale-Punter *et al.*, 2022). Along with a lack of rest days, equids are often required to work long hours and carry/pull very heavy loads. Increased rates of lameness have been seen in equids required to pull cartloads of over 700kg (Ali *et al.*, 2016a). Due to large differences in the sample populations, timeframe, species, and methodology across studies investigating lameness in working equids, it is not possible to directly compare or generalise the findings to large populations of working

equids. However, these studies all help to develop an understanding of the extreme amount of pressure placed on the musculoskeletal system of working equids and highlights a high risk of lameness in these animals.

### Equine Colic

Working equid owners across the world have reported equine colic as a significant concern (Stringer *et al.*, 2017, Bojia *et al.*, 2006, Wild *et al.*, 2021a, Kalamanova *et al.*, 2015, Salem *et al.*, 2017). The estimated rate of colic within these populations varies, with studies concluding that up to 55% of working equid owners experienced at least one episode of colic within their equid(s) within a 12 month period (Salem *et al.*, 2017). Salem *et al.* (2017) conducted interviews with owners of 350 working equids, dental examinations on 342 equids and blood samples from 100 equids in Egypt. Rates of colic relied on owner reports of medical problems they had seen within the 12 months prior to the study period. Owners reported a total of 371 episodes of equine colic distributed between 191 working horses. Whilst owner reporting increased participant and recall bias, this study does provide important insights into colic within working equid populations.

An additional consideration for these studies is the ability of owners to successfully identify equine colic. Only 12% of working equid owners in Morocco associated the term colic with gastrointestinal pain, 29% of owners were unable to name any causes of colic and 25% were unable to report any signs of colic (Kalamanova *et al.*, 2015). This was a small scale study of 102 participants conducted in Morocco using a standardised structure questionnaire, and therefore not generalisable to wider populations. However, it highlights an important consideration for studies relying on problem identification by working equid owners.

It is likely that working equids are at an increased risk of developing colic in comparison to other populations of sport or pleasure horses due to the

environments in which they are kept. A study conducted in India by Mohite (2014) reviewed clinical records from equids with signs of colic across 12 equine trading fairs. Sixty-five percent of reported colic episodes were the result of intestinal impaction, with a further 35% being spasmodic in nature. The authors speculated that these colic events were caused by the use of coarse feed and dehydration (Mohite, 2014).

The previous study based in India, highlighted the high risk of impaction colic within working equid populations, this has also been reported in populations in other geographical locations including Ethiopia (Bojia *et al.*, 2006). Bojia *et al.* (2006) assessed clinical notes from NGO clinical intervention sites and reported that of 134 reported episodes of colic, 58% resulted from impactions. Again, coarse feed was suggested as a cause for some of these cases. Additional identified risk factors were ingestion of polythene bags, fertiliser sacks and nylon clothes, and tympanic (gas) colic as a result of free access to mouldy feed. There is limited epidemiological evidence exploring the causes of equine colic in working equid populations; however the two studies previously highlighted high rates of impaction colic. This suggests that working equids may not have access to appropriate nutrition or water which can lead to an increased risk of colic. Equids may be more likely to scavenge if they have not received sufficient feed, and risk consuming plastic bags and other non-food items. Both of these studies used clinical reports suggesting accurate identification of colic and the causes behind each episode; however, these explore small populations in a limited range of geographical locations, and may not reflect causes of colic in populations in other parts of the world.

Internal gastrointestinal parasites can increase the risk of equine colic, which was reported as an underlying cause of colic in working equids in a study conducted with 93 working equid owners in Honduras (Wild *et al.*, 2021a). Heavy parasite burdens have been seen within some working equid populations in India and Mexico (Singh *et al.*, 2012, Valdéz-Cruz *et al.*, 2013) with high rates of strongyles in populations of working equids in Colombia (Ramírez-Hernández *et al.*, 2019). A large number of studies have identified

high frequencies of gastrointestinal nematodes in working equid populations across the world (Upjohn *et al.*, 2010, Getachew *et al.*, 2008, Yoseph *et al.*, 2005, Getachew *et al.*, 2010). Whilst heavy parasite burden can limit an equids performance and health (Yoseph *et al.*, 2005), some studies have found that there is no correlation between parasite burden and condition of the equid in adult working equid populations (Burden *et al.*, 2010, Valdéz-Cruz *et al.*, 2013).

### Infectious Diseases

A scoping review of seven papers investigated the impacts of equine epizootic lymphangitis (EZL) in working equids populations in Ethiopia (Bonsi *et al.*, 2023b). This review concluded significant socioeconomic consequences as a result of an equid's inability to work because of EZL infection (Bekele *et al.*, 2014, Molla *et al.*, 2021, Scantlebury *et al.*, 2015b). Other infectious diseases, such as *Streptococcus Equi* are commonly seen within some working equid populations, including those in Ethiopia and Lesotho (Laing *et al.*, 2018, Ling *et al.*, 2011). Erdemsurakh *et al.* (2020) reported that glanders was endemic to working equid populations in Mongolia. This study used randomly collected blood samples and serological testing from 337 horses across central and eastern Mongolia (Erdemsurakh *et al.*, 2020). There is still limited research into infectious diseases within working equid populations specifically; however, studies such as these develop a better understanding of the challenges that are faced within some of these communities.

A considerable amount of zoonotic diseases have been identified with over 50 reported in the horse (Sack *et al.*, 2020). Reports of diseases such as strangles and glanders raises the issue of zoonotic pathogen transmission. Strict biosecurity protocols, appropriate quarantining and disease screening, are able to limit outbreaks such as strangles (Boyle *et al.*, 2018). However, in low- and middle-income countries, especially within working equid populations, this kind of management is extremely uncommon. As a result, the spread of

infectious disease within equids and between humans and equids is a much higher risk within these communities.

### Skin Lesions

Skin wounds have been reported as one of the most frequent and severe welfare concerns for working equids (Pritchard *et al.*, 2005, Tesfaye and Curran, 2005, Burn *et al.*, 2008, Biffa, 2006). Skin lesions were seen frequently within a study of 160 horses and 40 mules within coffee-growing regions in Colombia (Romero *et al.*, 2022). Romero *et al.* (2022) directly observed the welfare of working equids using a validated protocol. Injuries to the hind limbs, flank, spine, withers and head were reported with a prevalence of between 13% and 30% of equids. Authors used non-invasive welfare indicators and general assessment guidelines from prior research (Pritchard *et al.*, 2005, Burn *et al.*, 2010a).

Burn *et al.* (2010a) evaluated behavioural and physical data from 5481 donkeys, 4504 horses, and 858 mules across nine countries over five years (Burn *et al.*, 2010a). The study reported an overall prevalence of skin lesions (excluding firing lesions) in 26% of equids. Country specific rates of skin lesions from this study ranged from 2% in The Gambia to 53% in Pakistan. Increased rates of skin lesions were reported in mules and donkeys in comparison to horses, older and thinner animals, those used in urban regions, and equids used for cart work, with a specific risk for those used for brick transport. Whilst Burn *et al.* (2010a) reported older equids were more often seen with skin lesions, Biffa (2006) reported that more wounds were identified in younger animals. This suggests that there may be additional factors that influence the risk of skin lesions more significantly. Burn *et al.* (2010a) associated the increased frequency of skin lesions in cart pulling animals to increased harnessing practices, and heavy loads. The relationship between increased wounds and the use of makeshift, ill-fitting tack was supported by additional studies conducted with 670 working equids in Ethiopia (Biffa, 2006); 86 donkeys in Jordan (Burn *et al.*, 2008); and 5248

equids in Egypt (Ali *et al.*, 2016b). Some owners will continue to use their equids with wounds caused by ill-fitting tack (Burn *et al.*, 2008). Whilst most of these studies focused on working equid populations within one country, the consistency of the association between cart-pulling equids and skin wounds suggests that regardless of the geographical locations equids used for this type of work are at an increased risk of wounds. The range in the reported frequency of skin lesions across all equids within these studies indicates variation in the significance of this problem across populations. This may be due to the differences in the uses of equids within each region, along with other external influences. Wounds as a result of trauma have also been identified in some populations of working equids in Ethiopia. Road traffic accidents are common in more urban areas, and hyena or donkey bites were more common causes of wounds in rural areas (Morgan, 2007). These wounds were linked to cases of lameness within a population of 2406 equids

The likelihood of equids receiving treatment for any health condition is low. Many owners have little to no access to veterinary care, and available veterinary professionals often have limited equipment and treatment products (Upjohn and Wells, 2018). This reduces the likelihood that equids will receive the support and care needed, and many will instead be provided with home-remedies, or left without any treatment (Wild *et al.*, 2021a, Nye *et al.*, 2021). The unreliability of veterinary support across working equid populations highlights the importance of considering external factors. With some owners unable to access professional support, interventions developed to improve the welfare of working equids must not rely on this. The need to consider other methods such as prevention of health problems are likely to improve working equid welfare more significantly.

### 1.3.2 Socioeconomic consequences of poor working equid welfare

It is clear that working equids face an extensive list of welfare concerns. This not only affects the working equids themselves but can also have major socioeconomic consequences for their owners. The death, sale, removal, or

reduced ability of a working equid due to ill health can result in reduced financial stability (Bonsi *et al.*, 2023a). Bonsi *et al.* (2023a), conducted a critical review of literature to investigate the socioeconomic consequences of poor working equid health and welfare. Twenty published studies were included in the review and authors concluded that the presence of disease in working equids led to negative socioeconomic consequences. However, this area of research is still limited. Studies included in this review investigated a mixture of infectious and non-infectious disease and focused on their impact on owner finances and social impact. Economic consequences included reduced income, increased expenses, loss of breeding potential, travel bans, and a loss of previous investment in equid care. Social consequences included stigmatisation, impacts on mental health and a loss of motivation.

With the societal importance of working equids discussed earlier in this literature review, it is also possible to understand how disease could impact other aspects of their owner's daily lives, including access to children's education, reduced human health due to the inability to access care services, reduced consumption of high nutritional value food, reduced access to clean water causing increased risk of water-borne disease, and reduced sanitation further increasing the risk of disease.

#### 1.4 Improving working equid welfare

Previously, support for working equids focused on provision of free veterinary care, and in the process focused solely on the animals (Curran *et al.*, 2005, Crane *et al.*, 2011, Galindo *et al.*, 2018). However, this provides a short-term solution to poor animal welfare as this treats the current problem rather than the root cause of the problem. More recently, non-governmental organisations (NGO's) have targeted animal welfare using a much broader number of measures, many of which spotlight the horse-human relationship and the significance of the role that owners play in equid welfare improvement. Methods used to target equid welfare now include advocacy, research, veterinary and para-veterinary work, general welfare messaging,

education, community participatory exercises, and skills initiatives (Haddy *et al.*, 2022). Haddy *et al.* (2022) conducted 32 semi-structured interviews with NGO staff across multiple organisations to explore the current approaches and knowledge around support provided for working equids. The authors highlighted that NGO staff felt that the provision of free veterinary support was less sustainable. Participants in this study reported that targeting equid welfare directly in this way was ignoring the larger key issues that were occurring. Instead, methods that explored the bigger picture and had more involvement with the owners and other stakeholders associated with equid care could have the potential to create larger impact. This study also showed the importance of tailoring support to individual contexts. The importance of developing a deep understanding of the target population, the problems faced and the external environment of these communities could help to improve the outcomes. This highlights the need to expand the methods used to develop interventions targeting working equid populations.

### 1.5 Development of interventions and human behaviour change

Research into human behaviour has grown in popularity and the consideration of intrinsic and extrinsic factors in behaviour has expanded the options for altering human behaviour. The majority of domestic animal welfare improvements require humans to change their behaviour. With the importance of the relationship between working equid and owner highlighted, this could be a valuable option to consider when developing interventions. There are many human behaviour change theories and models that underpin our understanding of human behaviour and how to develop interventions to change it.

Behaviour change models can be used to explain how, why and when a specific behaviour may or may not occur (Davis *et al.*, 2015). There are currently over 80 published theories of human behaviour that explore a multitude of contributing factors. Examples of human behaviour change models include the COM-B model (Michie *et al.*, 2011) and the



transtheoretical model of behaviour change (Prochaska and Velicer, 1997). These models can be used in intervention development to increase success in encouraging a desired change within a target population.

Development, implementation and evaluation of interventions can be challenging, and many interventions fail to elicit the desired outcome (Summerbell *et al.*, 2005). Developing interventions based on incomplete or inaccurate knowledge will increase the risk of failure (Johnston and Dixon, 2008). There are a variety of models to support intervention development, implementation and evaluation including intervention mapping (Fernandez *et al.*, 2019).

Intervention mapping provides a framework for both the development and the evaluation of interventions (Bartholomew Eldredge *et al.*, 2016)[Figure 2]. Intervention mapping is made up of six steps. The first step is to establish a detailed understanding of the problem including specific contexts such as the population, behavioural and environmental causes, and availability of resources. The second step describes the behavioural and environmental constraints, develops objectives for change in the behavioural and environmental causes, and confirms the targets for the intervention. The third step identifies the theory and evidence-based behaviour change methods and alter these to fit the practical application of the intervention. The fourth step combines each component into a coherent programme that is appropriate for the context. The fifth step requires the development of implementation strategies to facilitate the delivery and maintenance of the intervention. The final stage of this model is to plan both process and outcome evaluations to assess the efficacy and effectiveness of the intervention (Fernandez *et al.*, 2019). Intervention mapping has been used for a variety of interventions across human health settings (Pot *et al.*, 2018, Serra *et al.*, 2017, Rodriguez *et al.*, 2018).

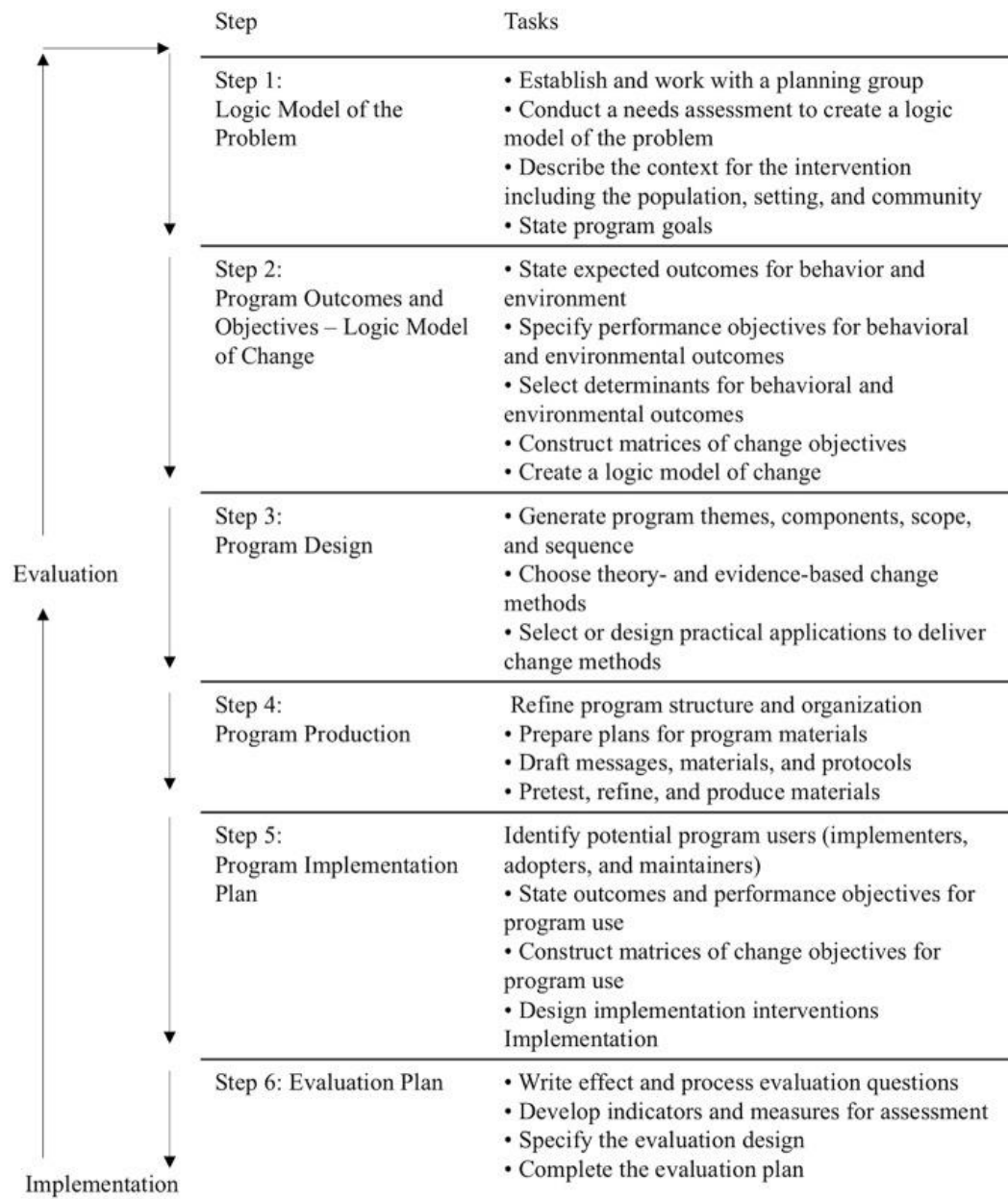


Figure 2: Intervention Mapping as described by Bartholomew Eldredge *et al.* (2016).

Human behaviour change interventions have been used to improve animal welfare (Glanville *et al.*, 2020). It is vital to identify how behaviour change will improve a situation and change targets must be identified prior to intervention development (Abraham and Denford, 2020). The same intervention carried out in the same way may have different outcomes if carried out in different contexts (Moore *et al.*, 2015). Evaluation of interventions is vital to assess fidelity, dose and reach (Moore *et al.*, 2015). The impact on the target population must also be considered to ensure that it is appropriate for the specific individuals the intervention is aimed at (Evans, 2003). Human behaviour change interventions have the potential to have a significant impact on the welfare of animals across the world.

## 1.6 Summary

The vast proportion of horses, donkeys and mules found across the globe are classified as working equids. These animals are extremely valuable to their owners, the communities in which they live in and the development of the global society as a whole. The impact they have can be seen on a huge scale, from providing the income needed to feed individual families living below the poverty line, to reducing climate change by providing an alternative to motorised vehicles.

These equids are used for a range of income generating and non-income generating activities. They support the agricultural industry and facilitate smallholder farmers in the production of crops. They are used for tourism, brick-kiln work, construction, and transportation of people and materials. The use of these equids goes beyond the daily tasks they are often owned for, with equids providing transportation for children to access education and people to access human health services, including in emergency situations. They are used during celebrations, community events and funerals. It is clear that these animals contribute substantially to millions of families around the world, many of which are living below the international poverty line.

The welfare of working equids is often compromised and health conditions such as colic and lameness are frequently reported within these populations. Working equids are found on almost every continent across the globe and are required to live and work in some of the harshest environments. With the huge variety of roles these animals perform, differences in their management and work requirements to the climate they live in, it is unsurprising that research findings between populations vary. With the majority of studies focusing on individual populations within individual countries, it is not always possible to generalise findings from this research. This highlights the need to fully understand the context of each population which will allow for the development of targeted interventions and will improve the outcomes of support provided to these animals and their owners. Monitoring changes to working equid owning communities following the Covid-19 pandemic was important to ensure any changes to these communities were considered in future research and support.

## 1.7 Aims and objectives

The main aims of this thesis were to explore working equid welfare and the external factors that influence this across Colombia. Additionally, this research aimed to develop an evidence-based intervention aimed to improve the welfare of working equids in Colombia through the prevention of equine colic.

The objectives of this thesis were:

- To assess any changes to working equid welfare and the livelihoods of their owners as a result of the Covid-19 pandemic, through surveys conducted across multiple countries
- To conduct focus groups with a variety of stakeholders across Colombia to explore the welfare of working equids and the livelihoods of their owners
- To explore the current knowledge and perception of equine colic through surveys with owners, and to identify potential risk factors for the development of colic in working equid populations in Colombia
- To develop an understanding of the barriers and facilitators to the prevention and management of equine colic within working equid owning communities in Colombia through focus groups and workshops with working equid owners
- To design and evaluate a targeted intervention for working equid owners to reduce the risk and impact of equine colic

## 2 Survey-based investigation exploring the impact of Covid-19 on working equid communities in low- and middle-income countries

### 2.1 Abstract

The welfare of working equids prior to the Covid-19 pandemic is well documented; however, there is little research looking at how the situation may have changed through the pandemic. Along with this potential change in equid welfare, it is important to consider the consequences to working equid owners.

This study aimed to report the impact of the Covid-19 pandemic on working equids and the communities that rely on them. Surveys were carried out between September and December 2021. Results were collected from fourteen partner organisations across Latin America, Africa and Asia. Sixty-two-percent (n=749/1201) of owners having experienced a decreased household income and 50% ( n=571/1132) of owners having experienced a decreased equid derived income. Forty-seven-percent (n=561/1199) of owners reported an increased cost of living with 31% (n=382/1208) reporting an increased cost of owning an equid. Some owners changed the management of their equids, including swapping to cheaper foods (30%, n=367/1219), reducing their equids supplements (27%, n=323/1219) and reducing the frequency they shod their equid (17%, n=206/1219). However, less than 1% (n=12/1219) had to give up their equids altogether. Since the start of the pandemic, owners reported an increase in the frequency of skin wounds, lameness, parasites and weight loss.

With equid derived and overall income having decreased and the cost of living and owning equids increased, further financial challenges may be seen. With increased financial implications, both owner livelihood and working equid welfare may be compromised further.

Contributions to chapter:

The development and analysis of the first round of this study was conducted prior to the start of this PhD (Wild *et al.*, 2021b). The piloting, data collection, and analysis of the first round of this survey was conducted by World Horse Welfare staff members. The primary researcher (JB) was involved in the development of the survey throughout (including prior to this PhD), including collation of pilot data, survey development, and staff training. Development and analysis of the second part of this study was carried out by the primary researcher (JB).

## 2.2 Introduction

The majority of research on the welfare of working equids has been conducted prior to the Covid-19 pandemic and there is currently little research investigating how the situation may have changed because of this disease outbreak. The international charity World Horse Welfare anecdotally reported that the welfare of working equids had been negatively impacted by the Covid-19 pandemic (Wild *et al.*, 2021b). However, it is currently unclear how much support was made available to working equid owners and their animals during this time period. In addition to the potential impact on equid welfare, it is important to consider the human consequences of the pandemic. Working equid owners are often extremely vulnerable, with research from Colombia identifying almost half of families living in extreme poverty before Covid-19 emerged (Burford, 2019). The financial stability of working equid owners relies on the productivity of their working equids (Arriaga-Jordan *et al.*, Stringer, 2014). As such, working equids are essential to a range of economic sectors including tourism and agriculture. Therefore, it is important to evaluate the impacts of Covid-19 on the livelihoods of these people and the welfare of the equids that they rely on. Understanding the effects of Covid-19 on working equids and their owners will help to identify further detrimental changes to the day to day lives of equids and owners and will facilitate further development of interventions and support for individuals living in these communities and their animals.



### 2.3 Aims and objectives

The aim of this study was to investigate the impacts of the Covid-19 pandemic on working equid owners.

The objectives of this study were:

- To identify changes in equid welfare and management as a result of the Covid-19 pandemic using an in-person, telephone and online survey.
- To identify owner reported changes to owner livelihoods, including financial implications resulting from the Covid-19 pandemic using a survey containing a mixture of open and closed questions conducted in the winter of 2021.
- To map the long- and short-term changes to working equid communities through the analysis of two rounds of a survey conducted in the winter of 2020 and the winter of 2021 .

## 2.4 Methods

### 2.4.1 Overview of methods

This study was distributed across 14 countries. There were two rounds of data collection; the first completed between November and December 2020 and the second completed between September and December 2021. This study was reviewed and approved by School of Veterinary Medicine and Science's Committee for Animal Research and Ethics.

### 2.4.2 Sample Population

Countries were selected based on current partnerships with World Horse Welfare. A total of 14 countries were selected [Figure 3]. Participants were recruited using a convenience sampling strategy. Recruitment occurred during equid health visits to each community. All participants were required to be over 18 years of age, and own or work with working equids. Survey data was collected by trained in-country teams employed by World Horse Welfare.



Figure 3: Map showing the 14 countries data was collected in a survey investigating the impact of the Covid-19 pandemic on working equid owning communities

### 2.4.3 Survey Development

The survey was developed using the 'SmartSurvey' online platform (SmartSurvey Ltd, Gloucestershire, UK)(SmartSurvey, 2023). Due to anecdotal reports of low levels of literacy amongst participants, questions and predominantly listed categorical responses were designed so that they could be read to participants if needed. Answers were then manually recorded by the data collection team. To allow flexibility between regions, the survey was available in French, Spanish, Khmer, Afrikaans and Nepali and could be completed either face to face, by telephone or via an online link. All responses were collected on paper before submitted electronically or entered directly on a mobile device.

### 2.4.4 Survey logistics and training

Safety of research staff and participants was a priority, and precautions were taken to reduce the risk of Covid-19. Where surveys were carried out in person, physical distancing, face masks and disinfecting hands and materials was required. Surveys were also carried out outside and were only carried out within areas where there were low rates of Covid-19. All data collection adhered to local and national restrictions within the area at that point in time.

Prior to the first round of this survey online training sessions were carried out for all project staff regardless of prior experience with data collection.

Training was carried out by UK based researchers from World Horse Welfare (IW and AG) and the University of Nottingham (KB and JB), and included information relating to sample size, randomisation, use of SmartSurvey, safety and phrasing of questions.

### 2.4.5 Pilot and survey development

#### 2.4.5.1 Round One

An initial pilot survey was developed and carried out by staff members from World Horse Welfare (IW, DW, AG) prior to this PhD, consisting of 24 open-ended questions, which were completed by 145 participants across Panama, Colombia, Nicaragua, Costa Rica and Guatemala in May 2020. Following pilot

data collection, the survey design was reviewed, and questions altered to improve understanding by the primary researcher (JB). Feedback was sought from individuals in World Horse Welfare's international team. The primary researcher (JB) then developed the survey into the finalised format that was then distributed. The final version of round one of the survey was developed using SmartSurvey and contained mainly closed questions with pre-defined categorical answers with options for free text responses if the response did not fit. This revised version was then piloted in Colombia, and further minor adjustments were made to improve understanding and clarity of wording. The first round of this survey included 38 questions exploring owner demographics, equid-related income, equid welfare, general financial situation, aid/ relief available and general impact of Covid-19 [Appendix I]. The survey was distributed across 14 countries between November and December 2020 [Figure 4].

#### 2.4.5.2 Round Two

Following completion and analysis of the first round of this survey, discussion with World Horse Welfare teams took place to collect feedback on question style, format, wording, survey length and any challenges faced during completion. The primary researcher (JB) developed the final version for use in the second round of data collection. The second round of the survey focused on longer term changes follow the pandemic. This survey included 31 questions investigating equid use, welfare and income, general finances, and general impact of Covid-19. Owners were able to select multiple answers throughout the survey if required [Appendix II][Figure 4].

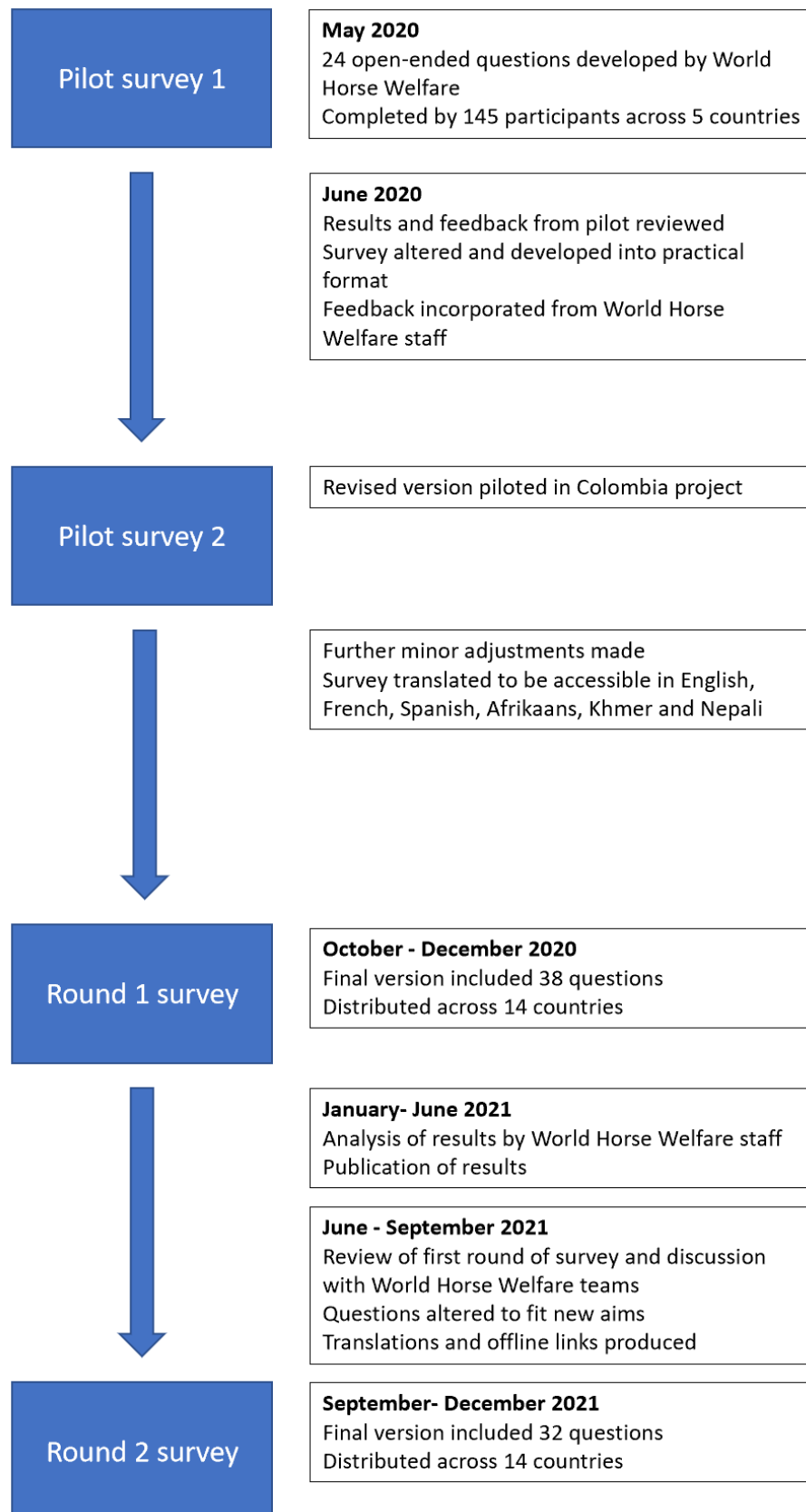


Figure 4: Diagram showing development of a survey investigating the impact of Covid-19 on working equid owning communities.

## 2.4.6 Data analysis

### 2.4.6.1 Round One data analysis

Data from round one of this survey was analysed and published by World Horse Welfare prior to the start of this PhD (Wild *et al.*, 2021b).

### 2.4.6.2 Round Two data analysis

Data from the second round was completed by the primary researcher (JB). Data was exported from SmartSurvey into an Excel spreadsheet (Microsoft Office 365, Microsoft) to allow for data cleaning and analysis. Free-text answers were translated from French, Spanish, Afrikaans, Nepali or Khmer into English using free online translating services (DeepL, 2017 and Google Translate). Duplicated results were identified using timestamps and comparison against copies of the completed paper survey. These were then discussed with the wider research team before being removed from the final data set.

Descriptive analysis was carried out on data with parametric data summarised using mean values, and non-parametric data summarised using the median and inter-quartile range (IQR). Frequency percentages were calculated for all categorical data, with free-text responses associated with pre-defined answer options of 'other' or 'comments' reviewed and grouped where applicable. Responses which required a free-text answer were reviewed individually before being categorised and ranked based on the frequency at which they occurred.

## 2.5 Results

### 2.5.1 Equid use and reliance

A total of 1219 participants from 14 different countries completed the second round of the survey between September and December 2021 [Table 1].



Table 1: Table showing breakdown of participants by country in a survey investigating the impact of the Covid-19 pandemic in working equid owning communities.

<b>COUNTRY</b>	<b>NUMBER OF PARTICIPANTS</b>
<b>COSTA RICA</b>	73
<b>COLOMBIA</b>	43
<b>GUATEMALA</b>	131
<b>HONDURAS</b>	53
<b>NICARAGUA</b>	89
<b>PANAMA</b>	71
<b>MEXICO</b>	107
<b>HAITI</b>	1
<b>SOUTH AFRICA</b>	27
<b>ZIMBABWE</b>	158
<b>LESOTHO</b>	100
<b>SENEGAL</b>	56
<b>NEPAL</b>	79
<b>CAMBODIA</b>	231
<b>TOTAL</b>	1219

Ninety-three percent (n=1134/1218) of participants completed the survey face to face, with a further 4% (n=52/1218) completing by telephone and 3% (n=32/1218) independently via an online link.

### Equid Ownership

Participants owned a mixture of donkeys, mules, and horses, with the median number of equids owned per participant being two equids (IQR 1-3 equids) equids. A total of 3058 equids were reportedly owned, with 1852 of these being horses, 1117 donkeys and 89 mules.

A total of 404 participants stated that the number of equids owned had changed since the start of the Covid-19 pandemic. A total of 13% (n=51/404) of participants had purchased one or more equids since the start of the pandemic. Reasons for this were not often given by participants, however four participants reported that this was due to an increased demand in equid based work, and one owner reported that this was to allow their other equid to rest. In addition, a total of 17% (n=67/404) of participants had one or more equids born since the start of the pandemic. A total of 30% (n=123/404) of participants sold at least one equid since the start of the pandemic. Reasons for sale included a lack of demand for equid-related services (2% n=8/404) and the affordability of owning an equid (5% n=22/404). Seven percent (n=27/404) of participants also reported that they sold their equid(s) because they needed the money for other things. Thirty-five percent (n=142/404) of owners reported one or more equids had died since the start of the Covid-19 pandemic; 10% (n=39/404) of these were due to drought, 6% (n=26/404) were due to health problems including colic and parasitic infections, and 4% (n=18/404) were due to predators. Other reasons for changes in the number of equids owned included equids being stolen (3% n=12/404), and equids being lost or going missing (7% n=30/404).

### Equid Workload and Use

Equids were used for a range of income generating and non-income generating activities. Crop (29%; n=346/1203), material (20%; n=240/1203)

and wood (18%; n=218/1203) transport were the most common income generating activities. Family (35%; n=426/1203) and wood (20%; n=245/1203) transport were the most common non-income generative activities [Table 2].

Table 2: Table showing income-generating and non-income-generating uses of working equids in a survey investigating the impact of Covid-19 on working equid owning communities.

	<b>INCOME- GENERATING</b>	<b>NON-INCOME- GENERATING</b>	<b>TOTAL</b>
<b>BRICK KILN WORK</b>	66	9	75
<b>RANCHING/ HERDING</b>	100	59	159
<b>PLOUGHING</b>	102	204	306
<b>TOURISM</b>	45	16	61
<b>RACING</b>	40	10	50
<b>CROP TRANSPORT</b>	346	196	542
<b>FAMILY TRANSPORT</b>	46	426	472
<b>PEOPLE TRANSPORT (NOT FAMILY)</b>	121	70	191
<b>WATER TRANSPORT</b>	50	147	197
<b>MATERIAL TRANSPORT</b>	240	188	428
<b>WASTE TRANSPORT</b>	116	65	181
<b>FIREWOOD/ WOOD TRANSPORT</b>	218	245	463
<b>FISH TRANSPORT</b>	4	4	8
<b>SCRAP METAL TRANSPORT/ COLLECTION</b>	51	9	60
<b>OTHER</b>	133	19	152

Since the start of the Covid-19 pandemic, 23% (n=277/1211) of owners had changed the type of activity that their equid was used for. Forty-six percent (n=556/1219) of participants reported that there had been a change in their equid's workload. Forty-nine percent (n=586/1208) of participants stated that their equid's workload had not changed since the start of the Covid-19 pandemic. Most owners (42% n=512/1208) who had reported a change in their equids workload, stated that their equids were working less compared to before the pandemic.

Many participants stated that their equid's workload changed but did not specify whether it increased or decreased. Thirty-four percent (n=190/556) of participants had experienced a decrease in demand. Seventeen percent (n=87/556) of owners directly stated that the Covid-19 pandemic had caused a change in their equid's workloads; reasons for this included the implementation of regulations and restrictions (6% n=32/556), as well as customers being afraid or suspicious of going out and using services (1% n=6/556). Seasonal variations were also highlighted by owners, including an increased rainfall (4% n=24/556). Other reasons included changes in equid age or health (4% n=22/556) and owners requiring an increased income (3% n=14/556).

### Income Generation

Twelve percent (n=139/1206) of participants relied on their equids for all their monthly household income, and 18% (n=211/1206) participants received over half of their monthly income from their equids. A further 47% (n=571/1206) of owners stated that their equids contributed to less than half of their monthly household income and 21% (n=248/1206) of owners stated that their equids currently did not contribute anything to their monthly household income. Half of working equid owners (50%; n=571/1132) had experienced a decrease in the income derived from their equids since the start of the Covid-19 pandemic whilst 31% (n=355/1132) had experienced no change in equid derived income and 4% (n=46/1132) had experienced an increase in equid derived income.

### 2.5.2 Change in owner economics

The cost of living had increased for 47% (n=561/1199) of owners; stayed the same for 36% (n=431/1199) of owners and decreased for 16% (n=190/1199) of owners. The total household income had decreased for 62% (n=749/1201) of owners, stayed the same for 30% (n=364/1201) of owners and increased for 6% (n=77/1201) of owners.

Participants who required additional income since the start of the pandemic used various methods to gain this additional income. Twenty-six percent (n=30/1219) of owners borrowed money from family and 17% (n=202/1219) from friends. There were 21% (n=254/1219) of participants who had relied upon extra jobs to increase their income. Other participants used a mixture of methods including borrowing money from the government (5%, n=61/1219), NGOs (1%, n=14/1219) and money lenders (8%, n=97/1219).

Forty-five percent (n=542/1197) of participants felt that before the Covid-19 pandemic, their financial situation was better than others in the same community who did not have a working equid. Thirty-nine percent (n=473/1197) of participants felt there was no difference between their financial situation and those who did not own equids, and 9% (n=79/1197) of participants felt that their financial situation was worse. At the time of the second round of the survey, 39% (n=464/1203) of participants felt their financial situation was better than those who did not have an equid, 42% (n=509/1203) felt there was no difference, and 12% (n=142/1203) felt that their financial situation was worse.

A total of 55% (n=650/1177) of owners stated that a lack of income was the biggest challenge they were currently facing, whilst 26% (n=302/1177) felt that personal health was the biggest challenge, and 12% (n=142/1177) felt the changes in living cost were their biggest challenge currently. Overall, 62% (n=746/1205) of participants were worried about their personal livelihoods, 27% (n=330/1205) stated that they felt neither good nor bad and 11% (n=127/1205) felt 'good' about their personal livelihoods.

At the time this survey was completed (September- December 2021), 65% (n=786/1203) of participants had received at least one dose of the Covid-19 vaccine. A total of 8% (n=97/1203) had been offered the vaccine but did not want it, and 24% (n=284/1203) had not been offered the Covid-19 vaccine.

### 2.5.3 Equid management and welfare

A total of 45% (n=539/1208) of participants stated that the cost of owning a working equid had not changed since the start of the pandemic, whilst 32% (n=382/1208) of owners had found that the cost had increased. Thirty-nine percent (n=475/1219) of participants had not made any changes to their equid care since the start of the pandemic. However, 30% (n=367/1219) of owners had changed to cheaper foods for their equid and 27% (n=323/1219) had reduced the supplements given to their equid [Table 3].

Table 3: Table showing changes to equine management as a result of the Covid-19 pandemic reported by owners in a survey investigating the impact of Covid-19 on working equid communities.

	<b>NUMBER OF PARTICIPANTS</b>
<b>CHANGE TO CHEAPER FOOD</b>	30% (n=367)
<b>REDUCED SUPPLEMENTS</b>	27% (n=323)
<b>REDUCED FREQUENCY OF SHOEING</b>	17% (n=206)
<b>UNABLE TO PURCHASE SADDLERY/ HARNESS EQUIPMENT</b>	5% (n=64)
<b>NOT USING A FARRIER</b>	12% (n=141)
<b>NOT USING A SADDLER</b>	3% (n=37)
<b>NOT USING A CBEA (COMMUNITY BASED EQUINE ADVISOR)</b>	2% (n=23)
<b>GIVING UP EQUIDS ALTOGETHER</b>	1% (n=12)
<b>NONE</b>	39% (n=475)
<b>OTHER</b>	3% (n=33)
<b>TOTAL</b>	1219



Almost half (49% n=591/1203) of owners stated that they would not be able to replace their equid if they were to lose it; whilst 42% (n=511/1203) would be able to replace their equid and 8% (n=101/1203) did not know.

Ninety-one percent (n=1105/1219) of owners reported a range of problems associated with the loss of an equid. Financial problems were the most common problems given by owners for if they lost their equid (53% n=581/1105). Sixteen percent (n=181/1105) of participants stated that they would have problems with transport if they were to lose their equid. Other consequences given included the sentimental or emotional impact of losing an equid (2% n=20/1105), and changes in family livelihood including being unable to eat (1% n=12/1105).

Many owners never performed shoeing/ farriery (37% n=439/1199), vaccinations (57% n=679/1199), saddle and harness checks (30% n=362/1199), teeth checks (59% n=704/1199), general health checks (41% n=490/1199) or equid health treatment (38% n=457/1199) with their equids at the time of the second round of this survey (September- December 2021) [Figure 5]. This level of activity was also reported before the Covid-19 pandemic, with little change in the number of owners who did not carry out these procedures with their equid [Figure 6]. Anthelmintic treatment was most commonly performed quarterly, both currently (45% n=545/1199) and before the pandemic (47% n=567/1199) [Figure 5][Figure 6]. These procedures were carried out by a range of different people; however, most equid procedures were completed by either the owner, vets or farriers.

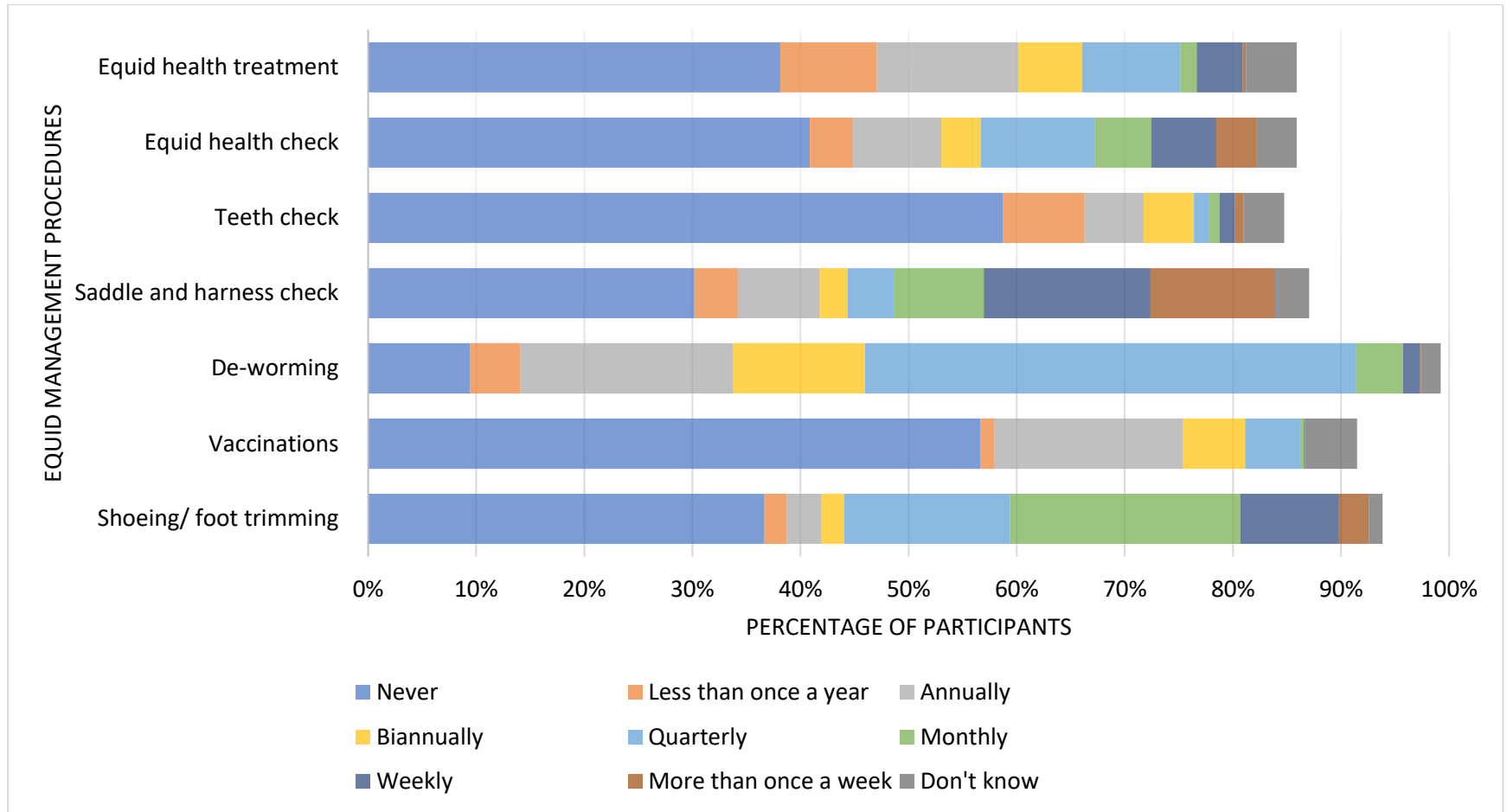


Figure 5: Bar chart showing the reported frequency of various equid management procedures carried out by working equid owners (n=1219) at the time of the second round of the survey (between September and December 2021) investigating the impact of the Covid-19 pandemic on working equid owning communities.

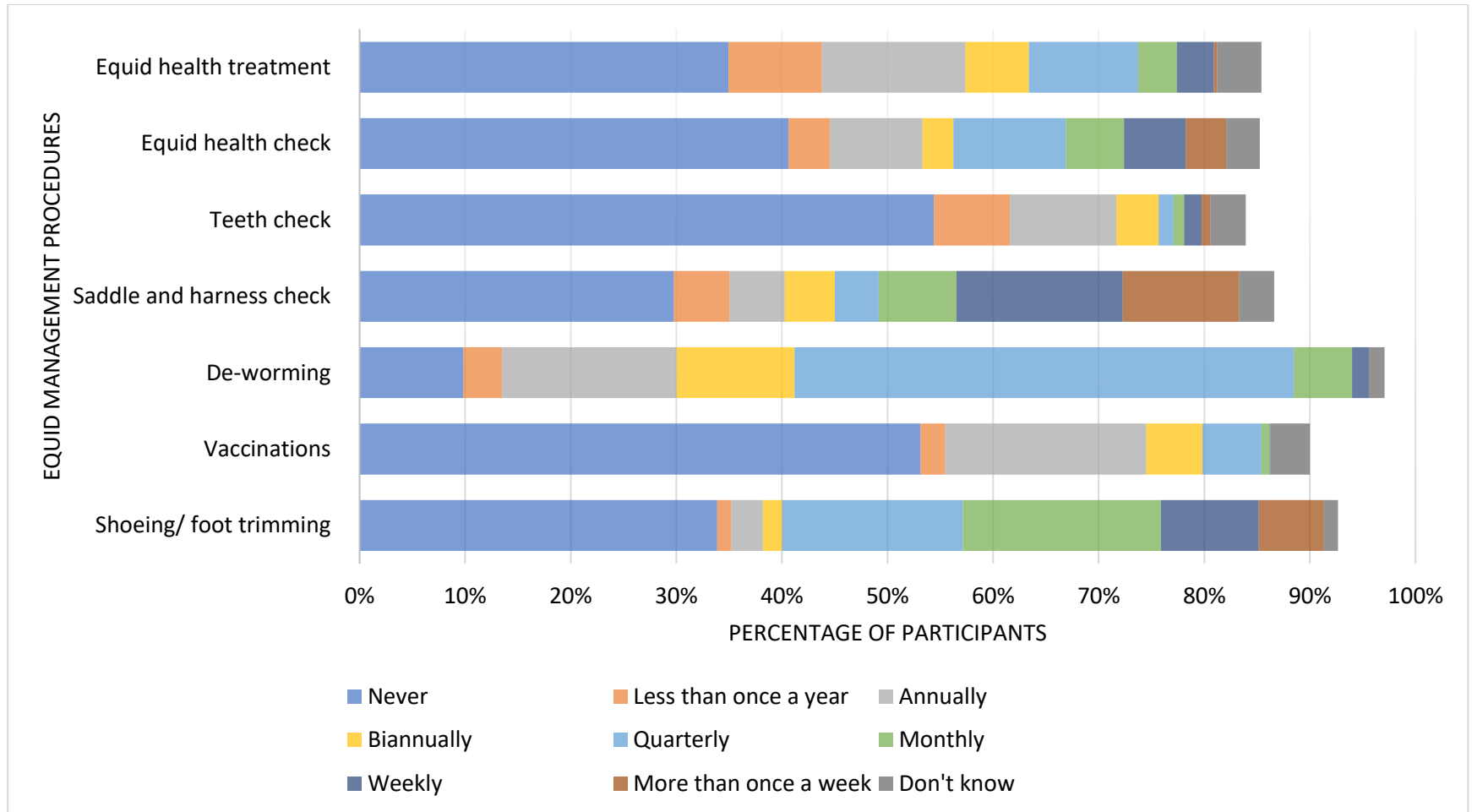


Figure 6: Bar chart showing the reported frequency of various equid management procedures carried out by working equid owners (n=1219) prior to the Covid-19 pandemic in a survey investigating the impact of the Covid-19 pandemic on working equid owning communities.

Equid services referred to those stated above and included farriery and veterinary treatment. A total of 50% (n=597/1202) of participants stated that there had been no change in the cost of these services since the start of the pandemic, whilst 33% (n=391/1202) of owners felt that there had been an increase in the cost. Seventy percent (n=845/1199) of participants had experienced no change in the availability of these services, 10% (n=123/1199) of participants had experienced a decrease in the availability of these services, and 4% (n=49/1199) felt there had been increased availability since the start of the pandemic.

The most common health problems seen in working equids before the Covid-19 pandemic were skin wounds (21%; n=248/1162), lameness (16% n=186/1162) and parasitic infections (16%; n=186/1162). Within the last three months, the biggest health problems were weight loss (29%; n=338/1162); skin wounds (25%; n=286/1162) and parasitic infections (21%; n=242/1162). Owners reported an increase in the frequency of many health problems including skin wounds, lameness, weight loss and parasites; however, participants reported a decrease in the number of working equids reported as experiencing respiratory and behavioural problems since the start of the pandemic [Table 4]. These changes to equid health were owner reported, and reasoning behind these changes was not explored.

Table 4: Table showing the frequency of equid health problems reported prior to the Covid-19 pandemic and within 3 months prior to survey collection (July-December 2021) in a survey investigating the impact of the Covid-19 pandemic on working equid owning communities.

	<b>BEFORE COVID-19 (ANY POINT PRIOR TO THE PANDEMIC)</b>	<b>WITHIN 3 MONTHS PRIOR TO SURVEY (JULY- DECEMBER 2021- DEPENDING ON SURVEY COLLECTION DATE)</b>
<b>SKIN WOUNDS</b>	21% (n=248)	25% (n=286)
<b>COLIC</b>	11% (n=122)	11% (n=122)
<b>LAMENESS AND HOOF PROBLEMS</b>	16% (n=186)	17% (n=195)
<b>WEIGHT LOSS</b>	15% (n=170)	29% (n=338)
<b>PARASITE PROBLEMS (INCL. TICKS)</b>	16% (n=186)	21% (n=242)
<b>RESPIRATORY PROBLEMS</b>	13% (n=146)	11% (n=126)
<b>BEHAVIOURAL PROBLEMS</b>	6% (n=65)	5% (n=63)
<b>OTHER</b>	2% (n=28)	2% (n=28)
<b>NO HEALTH PROBLEMS</b>	22% (n=250)	23% (n=270)
<b>RESPONSE TOTAL</b>		1162

Changes in the weight or body condition score of working equids varied, with 30% (n=362/1194) reporting an increase in their equid's weight, 38% (n=457/1194) remaining the same weight and 30% (n=355/1194) reporting a decrease in weight.

#### 2.5.4 Comparison with round 1

##### 2.5.4.1 Equid use and reliance

The first round of this survey was completed between November and December 2020 and explored the short term consequences of the Covid-19 pandemic (Wild *et al.*, 2021b). Whilst the first round of this survey was not collected as part of this PhD, results from the two rounds of this survey were compared to see how the situation in these countries changed over time, following the onset of the Covid-19 pandemic. Throughout this comparison, the first round of the survey is referred to as winter 2020 and the second round is referred to as winter 2021.

During winter 2020 (Round 1), 76% of owners had experienced a decreased income derived from their equid. During winter 2021 (Round 2) this had reduced to 50%.

##### 2.5.4.2 Owner economics

Forty-seven percent of owners had experienced an increase in the cost of living by winter 2021 (Round 2) compared to 34% during winter 2020 (Round 1). During both rounds of this survey, owners reported that they had experienced a decreased household income; however, this was less in the winter 2021 (Round 2) with 62% of owners having had a decreased income, compared to 78% in winter 2020 (Round 1).

Forty-five percent of owners felt their financial situation was better than those in their community without an equid before the pandemic, 39% of owners still agreed with this during winter 2021 (Round 2). Only 9% of owners felt they were in a worse financial situation before the pandemic and 12% during winter 2021 (round 2).

#### 2.5.4.3 Equid management and welfare

The number of participants who experienced an increase in the cost of owning an equid remained consistent at around 31%; however, more participants stated that there had been a decrease in the cost of maintaining an equid from 9% in the first round to 18% in the second round. Around half of participants reported that the cost of equid-related services remained consistent during both the first and second round of the survey and just over 30% of participants reported an increase in cost during both rounds of the survey. The availability of equid-related services remained consistent with 67% of participants reporting no change during the first round of the survey and 70% reporting no change at the time of the second survey. During the first round of this survey 15% of participants had experienced a decreased availability of these services, whereas only 10% of participants were experiencing a decrease in the availability at the time of the second round.

During the first round of this survey, 29% of owners had seen an increase in the weight of their equid, 41% had seen no change and 28% had seen a decrease. More participants reported seeing changes in their equid's weight at the time of the second round with 30% seeing an increase and 30% seeing a decrease.

## 2.6 Discussion

### 2.6.1 Overview of findings

Working equid owners reported that financial consequences of the Covid-19 pandemic were a major concern with over half of participants reporting a lack of income to be their biggest concern during the winter of 2021 (Round 2). A total of 76% of owners had experienced a decreased household income during the winter of 2020 (Round 1), and 62% reported this again during the winter of 2021 (Round 2). Half of participants had experienced a decrease in their equid derived income during the winter of 2021 (Round 2). Alongside a decrease in income generation, many owners reported an increase in the cost of living. The increased cost of living was reported by more participants during the winter of 2021 (Round 2). Almost half of working equid owners felt that prior to the pandemic they were financially better off than others in their community who did not own an equid; regardless of the decrease in income seen amongst many participants, this remained consistent, with many stating they felt the same after the pandemic.

There was a decrease in equid workload, attributed to the pandemic and seasonal variation. The changes to equid management and welfare were lesser than the financial impact of the pandemic. Whilst the financial repercussions of the pandemic were clear, further monitoring and investigation is needed to fully understand the effect Covid-19 has had on the welfare of working equids and the livelihoods of their owners.

### 2.6.2 Study limitations

This study aimed to understand the changing situation across a large number of countries and communities, so a survey was chosen. However, there were several considerations needed prior to the development of this survey. A large proportion of working equid owners have a low level of literacy (Stringer *et al.*, 2011, The World Bank, 2020a) which, along with sparse access to internet and social media (The World Bank, 2021a), meant an online survey would not be appropriate. However, due to Covid-19 restrictions such as



social distancing, quarantine, movement restrictions and potential participant anxiety around face-to-face meeting (Edouard *et al.*, 2020a), a completely in person approach may also have been less inclusive. A mixed-distribution method was used, and the survey was available to be conducted online, face-to-face or over the telephone. The use of a mixed-distribution method was vital to ensure inclusion of more isolated communities that are often excluded from other aggregate data (Egger *et al.*, 2021). Most surveys were performed face-to-face with in-country teams distributing and facilitating survey completion.

Convenience sampling was used during health visits to communities; this has been seen within working equid research due to time constraints and accessibility to participants (Wild *et al.*, 2021a, Sommerville *et al.*, 2018). Whilst this increased voluntary response bias due the potential for owners more concerned with their equids' welfare to be attending health visits and therefore completing the survey, this approach helped to increase participant numbers, with participant recruitment otherwise impossible. Whilst these results may not be representative of further working equid populations, the conclusions made from this data could be used by charities such as World Horse Welfare to directly support these individuals.

An initial survey was piloted across five countries in Latin America. Changes were made following discussion and feedback from participants, in country teams and UK based staff members from World Horse Welfare. Feedback considered the relevance of each question, along with how easily each question was understood by participants. Identifying potential issues, and allowing necessary adjustments was particularly important for this study. There is little research investigating the cultural and societal differences in working equid communities, making identification of potential issues prior to a pilot study more challenging. By piloting this survey and gaining feedback from a wide range of stakeholders, a better understanding of potential pitfalls was able to be explored. One aspect of difficulty within the development of this survey was the wording and understanding of each questions, particularly

considering how the meaning of questions may change once translated. Feedback from in-country teams was particularly important, as they had a better understanding of each country and community, along with the language spoken there. However, as piloting was not done in all countries, it is possible that the changes made prior to survey dissemination would not be appropriate for all participants.

### 2.6.3 Key findings

#### 2.6.3.1 Equid use and reliance

Working equids are vital to the financial stability of millions of owners and their families worldwide (Upjohn and Valette, 2014, Curran and Smith, 2005, Valette, 2015), with 76% of participants in this study relying on their equids for some or all of their income. Within some communities, the opportunity to work alongside these equids can provide an escape from extreme poverty (Smith, 2005).

Taking into consideration the financial reliance that owners have on their equids, it is concerning that 76% of owners had experienced a decreased income derived from their equid within 6 months following the onset of the Covid-19 pandemic; and that 50% of owners were still experiencing this decrease over a year after the onset of the pandemic. This is likely to have a significant overall impact on the financial stability of working equid owners, and these financial challenges were reflected further in this study when considering overall household income.

#### 2.6.3.2 Owner economics

The consequences of the Covid-19 pandemic have varied globally with low and middle income countries having been particularly badly affected (Egger *et al.*, 2021, Ravallion, 2020). Global inequalities have been highlighted as a result of the pandemic, with access to health care and vaccines in low and middle income countries often being challenging or impossible (Figueroa *et al.*, 2021a). Working equid owners often have limited access to health care, and around 25% of owners stated that human health was their biggest

concern during the winter of 2021 (Round 2). However, a large majority of owners had received at least one dose of the Covid-19 vaccine by the time of the second round of this survey. Whilst the access to human health care is lower in low- and middle- income countries, the direct impact of Covid-19 on human health is expected to have been less than in higher-income countries, due to the younger overall populations seen in low- and middle- income countries (Barnett-Howell *et al.*, 2021, Verity *et al.*, 2020).

The economic impact of the pandemic has been intensified in low and middle income countries with individuals having fewer savings and governmental support (Edouard *et al.*, 2020b), along with many people working in the informal sector and as a result having lower job security (Medina and Schneider, 2020, Bonnet *et al.*, 2019). An overall decrease in household income has been seen throughout low and middle income countries (Egger *et al.*, 2021) which was also seen within working equid owning communities within this study. Prior to the pandemic, the level of poverty amongst owners was high, with two thirds of owners living below the international poverty line in some countries (Burford, 2019, Van Dijk *et al.*, 2014). It has been estimated that the pandemic will result in an additional 75-95 million people will be pushed into poverty (Daniel Gerszon Mahler, 2022), which is likely to involve an increase in poverty and extreme poverty amongst working equid owners.

Whilst the consequences for owners may be substantial, many owners in this study still felt they are better off than others within their community who did not own an equid. This suggests there may be an even greater need for support within these wider communities, beyond the level acknowledged through working equid owners themselves. Despite working equid owners often being perceived as having financial challenges, in some countries, those who own equids are often wealthier than others in their community who do not (Smith, 2005, Fernando and Starkey, 1997). This highlights the importance of understanding the communities in which these working animals live and work, and to explore the impact these animals have on whole communities, and not just the lives of their owners.

### 2.6.3.3 Equid management and welfare

Health problems such as lameness, colic, skin wounds and parasitic infections have been reported in working equid populations for years, with the frequency of each varying but always remaining relatively high (Velazquez-Beltran *et al.*, 2011, Pritchard *et al.*, 2005, Haddy *et al.*, 2020b, Sánchez-Casanova *et al.*, 2014). Monitoring of common health problems in working equids is vital to provide targeted support. The World Organisation for Animal Health predicted that the economic impact of the Covid-19 pandemic was likely to have a secondary impact on the care and management animals received, and therefore their welfare (De Briyne *et al.*, 2020). A change in equine care has already been seen within higher-income countries, with research reporting changes to equine abandonment, equine business, general management practices and the access to veterinary professions and paraprofessionals (De Briyne *et al.*, 2020, Williams *et al.*, 2020). The management of working equids is often very different to the management of companion and competition animals seen in higher-income countries. This was reflected through this study with very few owners carrying out specific management practices such as shoeing, vaccination, and general health checks either prior to or since the Covid-19 pandemic. With fewer management practices being seen prior to the pandemic, it may explain the lesser effects on the management of working equids seen in this study.

Whilst there were slight changes in the frequency of some health problems seen in working equids in this study since the onset of the Covid-19 pandemic, it is important to consider the extent of these changes. There were slight increases in the frequency of skin wounds, lameness, and parasite infections; however, the reasons for these changes are unknown. All changes to equid health were owner reported, which must be considered. Of all health problems reported, weight loss was the biggest change seen. However, when asked about changes to weight, there was an even split between weight loss, weight gain and no change. Additionally, it is important to consider seasonal variations and subjectivity that may have impacted the perceived weight of

working equids across each country. It is difficult to draw conclusions from this study as all changes to weight were owner reported. It is unclear as to the impact the Covid-19 pandemic has had on working equid welfare globally. As a result, it is important to continue to observe the situation within working equid communities and explore how the situation may change.

#### 2.6.4 Future recommendations

This study highlighted the consequences of the Covid-19 pandemic on working equids and their owners. This study provided World Horse Welfare staff a better understanding of the problems facing working equids and their owners across their project communities. This was needed for working equid owners to be provided with appropriate, targeted support following the pandemic.

Research conducted prior to major global events such as Covid-19 may not be representative of the situation following these events. This study has shown the changes to some working equid owning communities across the world. The results from this study should be taken into consideration when considering how existing literature reflects these communities. With the increased financial challenges highlighted, it is important to anticipate that socioeconomic research may be less representative following the Covid-19 pandemic.

## 2.7 Conclusions

The aim of this study was to establish changes in the lives of working equids and their owners as a result of the Covid-19 pandemic. This was important to ensure any changes to these communities were considered in future research and support. Financial challenges were the most significant change to occur: owners reported a decrease in their equid derived and overall income and an increased cost of living. This will likely put a huge strain on these individuals who are often already experiencing financial challenges. This change in income, inevitably would have impacted management decisions made by owners, including those around nutrition and farriery; however, the true impact on equid management was unclear. Whilst the overall health of working equids was not reported to have declined significantly, the impacts of any management changes may have detrimental impacts on equid welfare in the longer term. It is unlikely that the full impacts of the Covid-19 pandemic were accounted for throughout this study, and the impact the pandemic has had on equids and their owners may be far greater than concluded here. Further research is needed to monitor the situation and explore any further changes that may occur. The findings of this multi-national study identified the impact of the Covid-19 pandemic on specific working equid communities. This information can be used to inform strategies to support working equid communities if future pandemics were to occur. The findings from this study should also be considered when developing aid for these communities, to ensure any support is still appropriate to the target individuals.

### 3 Evaluating the impact of equid owner behaviour and decision-making on working equid welfare: A qualitative investigation

#### 3.1 Abstract

There are an estimated 1.5 million working equids in Colombia who provide vital support to many families living below the international poverty line. The relationship between equid and owner is mutually beneficial, with equids having to trust their owners for survival and owners relying on their equids for financial stability and overall livelihood satisfaction. Every aspect of an equid's day to day life is determined by their owners/carers.

This study aimed to explore the factors that influence the welfare of working equids and the livelihoods of their owners in eight communities in Colombia.

A total of 24 focus groups were carried out, to explore the perceptions of a range of stakeholders including; working equid owners, women and community leaders. There were between 1 and 12 participants per focus group. Focus groups were carried out in Spanish by an in-country team and used a loosely structured narrative script. Participants were asked about their community, their reliance and relationship with their equids, and any equid related problems they face. Audio recordings were subsequently transcribed and translated to English. Thematic analysis was performed using NVivo using a mixed inductive and deductive approach.

Thematic analysis identified four overarching themes: 'Testing external environment: "Surviving... is very hard"', 'Horse-human relationship: "Some owners have their horses in good condition... but others... tied up on a rope"', 'Cross-generational knowledge transfer: "We have to believe the elderly"', and 'Traditional management practices: "Fill a rucksack with wet ashes"'. The four overarching themes interact with each other, and all ultimately impact the welfare of working equids within the eight communities across Colombia.

This study has highlighted the importance of a One Welfare approach in improving the lives of both equid and owner. Understanding decision-making processes and behavioural patterns of owners, and external influencing factors is essential in the development of targeted interventions and improving the impact of support provided within these communities.

Contributions to chapter:

Development of methodology was carried out prior to this PhD by staff members from The University of Nottingham (KB, JHB) and World Horse Welfare (IW, DW). Data collection was conducted by researchers from Universidad de CES (SH) and Fundación Arrieros Colombia (CJ, SP). Data analysis was conducted by the primary researcher of this thesis (JB).



### 3.2 Introduction

Working equids are found across the globe, with an estimated 1.8 million equids living and working in Colombia (FAOSTAT, 2022). These animals support some of the poorest communities in Colombia, with two third of working equid owners in Colombia living below the poverty line (Burford, 2019). Results from Chapter Two of this thesis indicate that many working equid owners have experienced further financial challenges since the Covid-19 pandemic. These financial constraints will impact working equid owners quality of life and have the potential to have future knock-on effects to working equid welfare.

There are a number of factors that will contribute to the care working equids are provided with. By exploring the bigger picture of these communities, it may be possible to improve the welfare of equids along with the livelihoods of their owners.

The importance of considering the equids, their owners and the environment as a whole has been highlighted, both with the development of the one welfare framework (Pinillos *et al.*, 2016), and within working equid research (Luna *et al.*, 2017, Luna *et al.*, 2018, Haddy, 2022). One welfare focuses on the interrelationships between animal welfare, the livelihoods of humans and the wellbeing of the external environment. The framework emphasises that each of these components interact and impact each other and so should not be viewed in isolation.

The relationship between working equid and owner is vital, with the care equids are provided with directly influencing their welfare status (Luna *et al.*, 2017). Internal factors such as increased empathy towards working equids has been associated with improved levels of equid welfare (Luna *et al.*, 2018). However, there is still limited research investigating this vital relationship between equid and owner.

Beyond the human-animal relationship, there are a vast number of external factors that influence both animal welfare and human livelihoods. There is a

limited number of studies investigating the social and physical environment of working equid owning communities specifically (Haddy *et al.*, 2020a, Watson *et al.*, 2022). As discussed throughout the literature review, the context of working equid owning communities varies greatly. To the knowledge of the primary researcher there are currently no studies to explore the context of working equid owning communities in Colombia with specific focus on the relationship between equid welfare, owner livelihoods and the external environment. The lack of understanding of these communities makes it challenging to appropriately and effectively support these individuals and their animals. By exploring the bigger picture it will be possible to develop a better understanding of working equid owning communities and the challenges they and their animals face.

### 3.3 Aims and objectives

This study aimed to explore the factors that influence the welfare of working equids and the livelihoods of their owners in Colombia.

The objectives of this study were:

- To explore the relationship between working equids and their owners through focus groups with a variety of stakeholders across Colombia
- To explore working equid owner behaviour and decision making through focus groups with a variety of stakeholders across Colombia
- To investigate the external environmental factors that influence the lives of working equids and their owners across eight regions of Colombia
- To highlight challenges experienced by working equids and their owners through focus groups conducted across eight regions in Colombia

### 3.4 Methods

This project has been approved by the School of Veterinary Medicine and Science's Committee for Animal Research and Ethics (CARE). The Consolidated Criteria for Reporting Qualitative research (COREQ) guidelines (Tong *et al.*, 2007) have been used as a framework for the reporting of this study.

#### 3.4.1 Sample population

Participant recruitment was carried out by staff members from Fundación Arrieros Colombia (CJ). The communities contacted were selected based on their use and population of working equids. All communities that responded and were willing to participate were included in this study.

#### 3.4.2 Participant recruitment and selection

Fundación Arrieros Colombia contacted regional administrative offices across Colombia to inform them about the research study. Regional administrative offices then informed community leadership figures and working equid owners. In addition to this, owners in Apartado were contacted directly by Fundación Arrieros Colombia through a pre-existing database. One of the communities in Santa Marta (Kütünsuma) was contacted through "Fundación Salud para el Trópico" who were carrying out research within the community. Volunteer sampling was used with participants self-selecting to attend following being informed of the study.

Community leadership figures included majors, private veterinary professionals, Unidades Municipales de Asistencia Técnica Agropecuaria (UMATA, a governmental body providing technical assistance to farmers) and government veterinary professionals, agrovets, farriers, relevant store owners (e.g. those who sell horseshoes), other individuals involved with working equids (other than owners), and any other individuals of importance within the community (e.g. could include restaurant owners etc).

A range of stakeholders were involved in this study in order to gain a range of perceptions. Participants were allocated to one of three groups: 'women', 'owners' or 'leaders' depending on their gender, their role within the

community and their involvement with working equids. The number of participants in each focus group varied depending on region and group. There was no limit on the maximum or minimum number of participants required for this study.

Due to low levels of literacy, verbal consent was obtained prior to engagement in focus groups, after reading out participant information and personal rights and expectations of individuals.

#### 3.4.3 Focus group development

Focus group development was carried out by staff from the University of Nottingham (KB, JHB, SF), World Horse Welfare (IW, DW), Universidad de CES (SH) and Fundación Arrieros Colombia (CJ) prior to the start of this PhD. Several meetings and discussions were held during the development process with the final draft of the focus group containing two sections investigating the social and physical environment of each community, and the role and welfare of working equids [Appendix III].

#### 3.4.4 Research team and reflexivity

All focus groups were carried out by research staff members from Universidad de CES (SH) and Fundación Arrieros Colombia (CJ). All research team members had received training on conducting focus groups by staff members from Nottingham University (KB) prior to data collection. Weekly meetings were organised and led by the primary researcher (JB) during the data collection period. During these meetings, feedback on data collection was given, and adjustments were made to focus group schedules where appropriate. Reflexivity statements from the Primary researcher (JB) and in-country researchers (SH, CJ, SP) are available [Appendix IV, Appendix V].

#### 3.4.5 Data collection

##### 3.4.5.1 Setting of data collection

Data were collected in person in eight regions across Colombia between March and May 2021 [Figure 7]. Three focus groups were carried out in each region. In the Santa Marta region (No. 8), two of the focus groups (working

equid owners and women only groups) were carried out in Machete Pelao, and one (community leadership figure group) in Kütünsuma. Kütünsuma and Machete Pelao are two separate communities that are extremely geographically close and so were included together as one region.

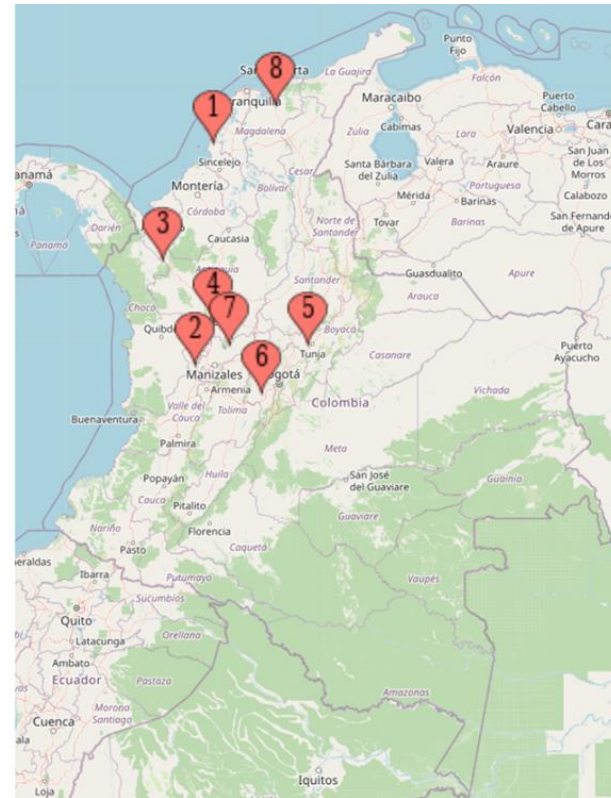


Figure 7: Map of Colombia showing the eight regions where data was collected in a qualitative study investigating the lives of working equids and their owners in Colombia.

Focus groups were conducted in a mixture of settings. Most were carried out in an informal spaces away from the general public such as in spaces within restaurants, classrooms, and town halls. Some focus groups with community leadership figures were conducted in more formal settings including meeting rooms. An introduction to the study and research team were given at the start of each focus group. Data collection were carried out in Spanish. All focus groups were audio recorded to allow for translation and transcription.

A brief introduction was given at the start of each focus group, including information about the context of the study and an introduction to the researchers. Participants were then asked to give a brief introduction to who they were, including their role within the community and their involvement with working equids.

#### 3.4.6 Data analysis

##### 3.4.6.1 Transcription and translation

Transcription and translation from Spanish to English was carried out by a staff member from Universidad de CES (OG). During transcription, intelligent verbatim was used and identifying content was removed. Transcripts were reviewed by the primary researcher (JB) to check for clarity and remove any remaining identifying content. Any abbreviations or words specific to Colombia were identified and defined. Participants did not review transcripts prior to coding.

##### 3.4.6.2 Coding and theme generation

Data handling and coding was completed using NVivo software (QSR International Pty Ltd. Version 12). Transcripts were split into type of focus groups ('leaders', 'owners' and 'women') and downloaded into three separate NVivo workbooks.

Inductive coding was carried out on two transcripts from each group (total of six transcripts were coded). Code-books were then re-evaluated. Codebooks and transcripts were then double coded by a secondary coder (KB). These



transcripts were then re-coded following discussions on improving coding techniques. The further eighteen transcripts were then coded inductively.

Visual mapping was then used to identify sub-themes by grouping similar codes. During visual mapping, the COM-B model of behaviour change (Michie *et al.*, 2011) was used to support the development of overarching themes. Following the identification of the COM-B model as a framework in data analysis, all transcripts were additionally coded deductively to reflect this. The use of the COM-B model is explored in further depth in the discussion of this chapter. Each set of focus groups (owners, leaders and women) were looked at separately and then combined when similar themes were noted. Overarching themes were identified for all data.

In addition to the thematic analysis conducted, a simple summary of results for each community was developed. This combined the findings from the leaders, women and owners focus groups within each community. These summaries were developed to be used by World Horse Welfare, Fundación Arrieros Colombia and Universidad de CES to guide projects beyond this PhD.

### 3.5 Results

#### Overview

Twenty-four focus groups were conducted across eight regions in Colombia between March and July 2021. Participants were divided into three interview groups: 'women', 'leaders' and 'owners'. There were between one and 12 participants per focus group. The leaders' focus group in Santa Marta-Kütünsuma was the only focus group conducted with only one participant as this was the first interaction with this indigenous community and discussion with only the mamo was more appropriate. The role of the mamo and the cultural and social norms within this community are discussed in detail in the final discussion of this thesis.

Each community was analysed individually to explore challenges specific to each region. A summary of each community is available in the appendices and highlights the differences seen [Appendix VI].

#### Participant demographics

Participants allocated to the owners' focus group owned, rented, or worked directly with working equids. A mixture of mules, donkeys and horses were kept, with participants owning between one and six equids in total. Equid experience varied, with some participants having been involved with equids for over forty-five years. Equids were used for a range of activities, such as the transportation of crops, tourism, and recreation. Participants allocated to the leaders' focus group worked in a range of professional roles, including members of regional and national administration, vets, agricultural technicians, and other leadership figures. Direct exposure with working equids varied, with some participants owning equids, whilst others had no experience with equids at all. The women's focus group was made up of female participants ranging in age, profession and level of involvement with working equids. There was some overlap between groups with some female participants able to be classed into multiple focus groups. In these situations participants were allocated to whichever group was most relevant depending

on their level of experience with equids or within a leadership role, and participant preference.

### Thematic Analysis

Thematic analysis identified four overarching themes and each were represented by a quotation selected from all focus groups which expressed the collective participants views clearly:

- Testing external environment: *“Surviving... is very hard”*
- Horse-human relationship: *“Some owners have their horses in good condition... but others... tied up on a rope”*
- Cross-generational knowledge transfer: *“We have to believe the elderly”*
- Traditional management practices: *“Fill a rucksack with wet ashes”*

The four overarching themes interact with each other, and all ultimately impact the welfare of working equids within the eight communities across Colombia [Figure 8].

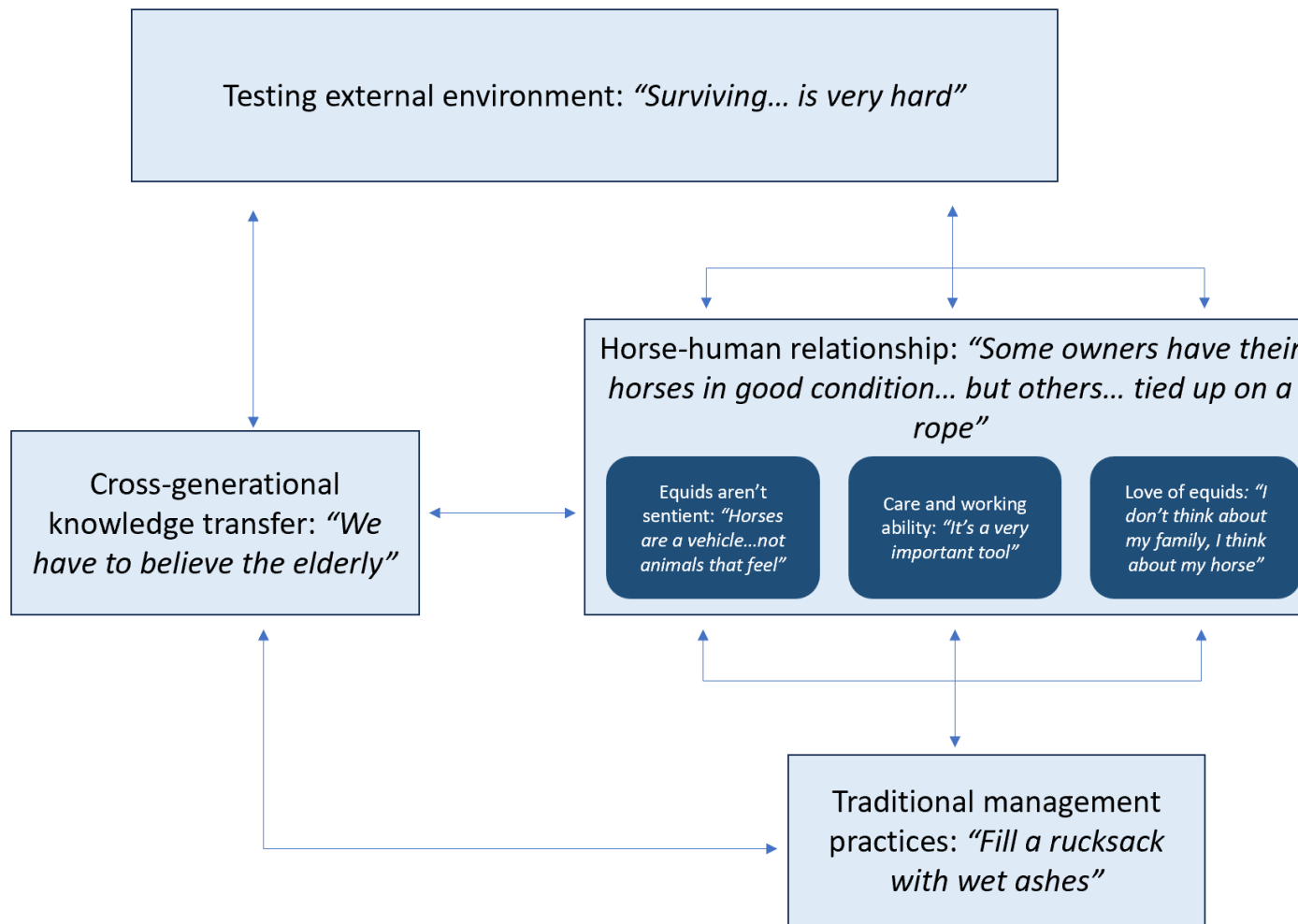


Figure 8: Figure showing the four overarching and associated sub-themes identified in a qualitative study investigating the lives of working equids and their owners in eight regions across Colombia.

### 3.5.1 Testing external environment: *“Surviving... is very hard”*

The overarching theme ‘Testing external environment: *“Surviving... is very hard”*’ had six associated sub-themes that were split into social and physical environment [Figure 9]:

- Physical environment
  - Demanding topography and limited road access: *“There are parts where it’s impossible to build roads”*
  - Insufficient utilities and basic resources: *“The water from the cistern is dirty”*
  - Financial constraints: *“Poorest of the poor”*
- Social environment
  - Significant variation in regional and national administration: *“Without police... nothing can be done”*
  - Conformity: *“People will admire the beautiful mules”*
  - Family unity: *“We are a team; our families are always there for us”*

Each of these sub-themes explores the external environment working equids and their owners are living in and will interact with an owners ability and motivation to carry out certain behaviours. In some cases, such as the challenging topography of each region, these will directly impact the welfare of working equids.

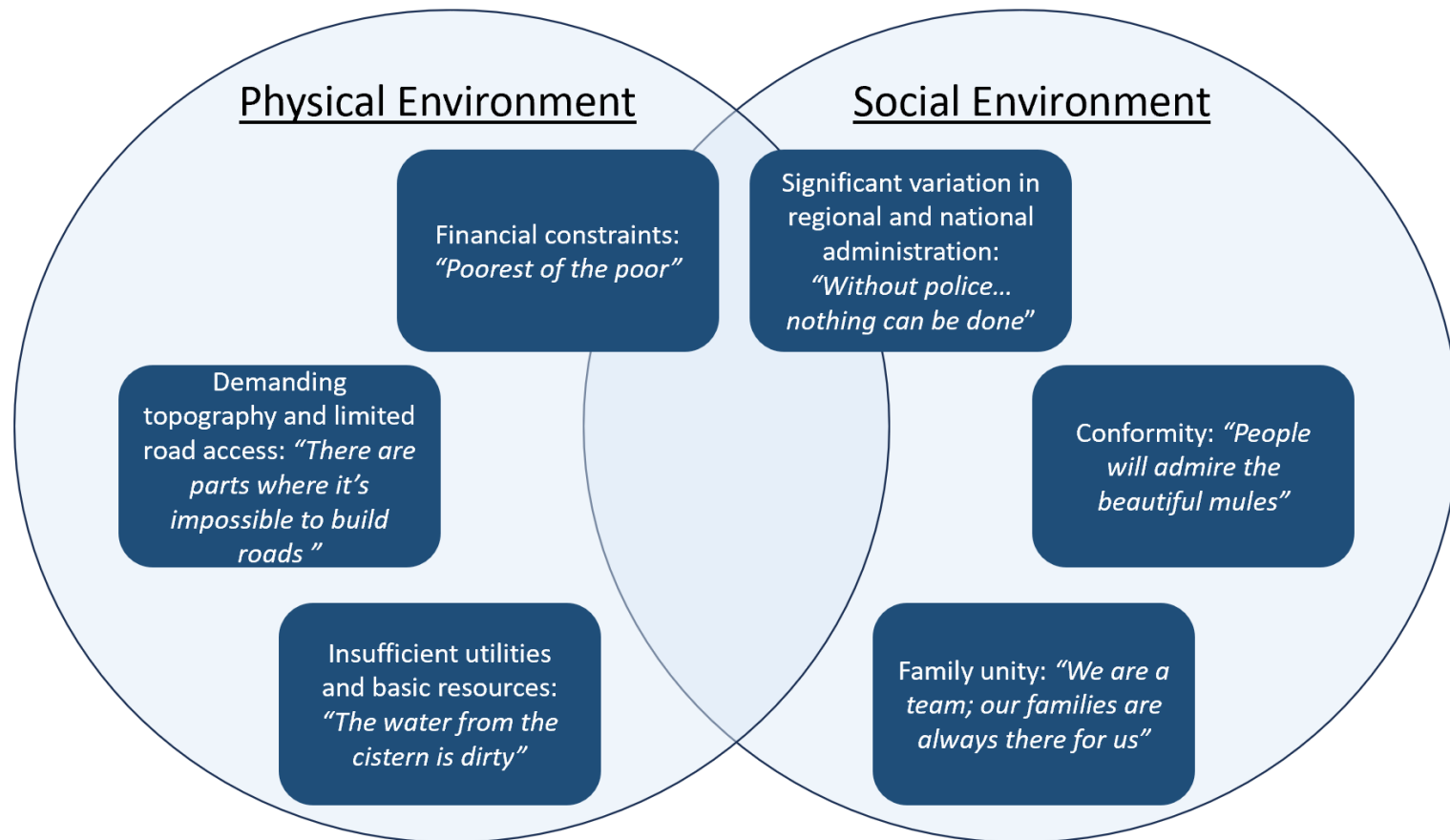


Figure 9: Figure showing the six sub-themes associated with the overarching theme: ‘Testing external environment: “Surviving... is very hard”’ identified in a qualitative study investigating the lives of working equids and their owners in eight regions across Colombia.

3.5.1.1 Demanding topography and limited road access: *“There are parts where it’s impossible to build roads”*

The topography across each community was discussed in focus groups. The challenging geography within some regions in Colombia means the use of motorised vehicles would be extremely challenging or impossible. This topography means that equids are very important in providing vital transportation of crops, material and people, which causes an increased motivation to own equids.

Leaders from Cocorna discussed the complex topography within the region that made it difficult to transport foodstuff and building material into the community. In Cocorna it was clear that equids were vital to the transportation process to some of the most rural families and communities.

*“We have a very complex topography that makes it difficult to bring in foodstuffs... building materials... so equids are very important because they help us with the transportation process to very far away hamlets.”- Leader from Cocorna*

Women from Villeta highlighted that working equids were beneficial due to the complex topography. Owners in Santa Marta stated that some terrain cannot be crossed, even by equids.

The topography can make it difficult to build roads, and flooding causes road quality to worsen.

*“What people from outside don’t understand is that we have a very broken topography and there are parts where it’s impossible to build roads.”- Owner from Andes*

Leadership figures and women from Villeta, and women from Cocorna and Entrerrios reported that bad weather and heavy rainfall is a problem for maintaining road quality. This will impact the transportation ability of motorised vehicles throughout the year.

*“The access roads to hamlets are not paved... they must be in constant maintenance and sometimes it is not enough due to the rain, and this is chaotic.”- Woman from Villeta*

Leaders and women in Entrerrios, leaders in Villeta and owners in Santana reported good quality roads to most rural areas and highlighted the ongoing maintenance of the roads by the local administration.

Leaders in Santana reportedly used motorbikes to access areas with bad road quality, yet some roads were so badly damaged that they were only accessible by equids. Owners from Andes, Apartado, Entrerrios, Santana, Santa Marta and Villeta, women from Cocorna and Villeta, and leaders from Cartagena reported problems with poor road quality within the region. Owners from Cocorna and Villeta stated that there were currently improvements being carried out to improve road quality.

Participants identified support from individuals within the community in Entrerrios, and some support from agricultural companies to improve road quality and access. However, it was clear that there were further improvements needed across regions.

*“Everyone has helped improve the roads, but it would be good to have more help.”- Owner from Apartado*



In addition to private transportation, leaders from Entrerrios and women from Cocorna reported on the availability of chivas (public buses) within the region. Women in Cocorna explained that working equid owners often transported crops from their farm to the main road where they left their equid and used the chiva service to get to larger towns and then returned to their equid afterwards. Leaders in Cartagena reported that the chiva service did not cover the whole area, and they were currently experiencing more problems associated with public transport.

#### 3.5.1.2 Insufficient utilities and basic resources: *“The water from the cistern is dirty”*

The sub-theme ‘Insufficient utilities and basic resources: *“The water from the cistern is dirty”*’ referred to the availability of basic services within each community. Utilities often improve an individual’s quality of life. Whilst most of these will be centred around human livelihoods, some may have a direct impact on equid welfare e.g. the availability of clean water within a community will directly impact both human and animal water resources. It was clear that there was regional variation and individual differences with the perception of the availability and quality of utilities.

Leaders from Apartado and Santana and owners from Apartado, Cocorna and Santana stated that utilities were of an acceptable standard within the communities. Women from Cocorna, Entrerrios, Santa Marta, Santana and Villeta reported that most individuals within the community have access to basic utilities including water and electricity.

Leaders from Cartagena indicated that utilities were expensive and insufficient within the area. Owners in Cartagena reported a change in the companies providing some utilities which had caused a decrease in the quality of services. Secondary to this, owners in Cartagena reported blackouts of up to 18 hours, which created difficulties because of the high temperatures within the region.

Leaders from Cocorna and Villeta and owners from Entrerrios and Santa Marta reported that electricity was available in most households within each region. However, other owners from Santa Marta reported that electricity was not available to everyone and that there was no support to fix it if anything broke, resulting in owners having to try to fix it themselves. Leaders from Cocorna highlighted that there were still some rural households without electricity or internet. Women from Santana reported a lack of internet within the community, particularly within rural areas.

Access to clean drinking water varied between regions. Poor access or contamination of water was reported by leaders in Villeta, Santana and Cartagena. In Santana, this was a particular problem during the dry season. Women in Santana also reported problems with accessing clean water. Women in Cocorna warned that the water was not safe to drink and needed to be boiled and processed by individuals at home before consuming it.

In other regions people had access to clean drinking water. Participants from the owner's focus group in Santa Marta commented that the water was drinkable from natural springs. Owners from Apartado and Cocorna and leaders from Santana reported that they were able to access clean water.

There were conflicting opinions on the accessibility and quality of water within communities. This was seen both across leadership figure, women and owner focus groups, and in some cases with individuals within the same focus group. This suggested that the perception of water quality varied within communities as well as between different communities.

*"The municipality and the hamlets have their own water supply systems... the water here in the municipality is 92% potable."- Leader from Santana*

*“The water from the cistern is dirty and yellowish... the administration built a treatment plant with little money, and I don’t know what happened, but it never worked...”- Woman from Santana*

Leaders from Cartagena also identified that the limited access to clean water had caused biosecurity problems during the COVID-19 pandemic as individuals were unable to wash their hands.

Health care also varied slightly between different regions. Some regions including Villeta, Cocorna, Entrerrios and Santana stated that they had access to human health care.

*“We have a good hospital... newly built... very well equipped and it’s working well now.”- Owner from Entrerrios*

Other regions including Cartagena and Santa Marta were described as having insufficient human health care.

Health care problems reported by women in Santa Marta were a lack of medications, long distances required to reach medical support along with a lack of transportation options and a lack of local medical support.

*“If a person gets sick, at times, they don’t have medication for that person.”- Woman from Santa Marta*

Health care related problems in Cartagena were reported by leaders and owners. Owners discussed the health care in Cartagena in detail. Owners described the health care services as inconsistent with long waiting times and

a lack of medical equipment. Additionally, anecdotes where the lack of medical care had caused major consequences to family and friends' lives.

*"The situation is so precarious that the girl died within an hour."- Owner from Cartagena*

*"We got to the hospital and first, he had a covid test and when he was given the results, it was too late."- Owner from Cartagena*

Participants from Cartagena acknowledged that the pandemic had worsened human health systems. The lack of health care available was discussed in general terms with some participants identifying how these problems were aggravated during the pandemic.

*"I don't think that with the covid we have enough ICU beds."- Leader from Cartagena*

*"To add to this information, I would say that in terms of health we are bad. Here in the hospital, the service is bad and with the covid they have an excuse to forget about other illnesses."- Owner from Cartagena*

Owners from Andes, Apartado, Cocorna, Entrerrios, Villeta, and Santa Marta reported limited access to veterinary treatment and care. However, leaders from Andes, Apartado, Cocorna, Entrerrios, Santana and Villeta reported the presence of multiple vets within the region. Leaders in Cocorna felt owners may be unaware of available vets within their area due to changes in their availability since the Covid-19 pandemic. Participants were not clear as to

whether they were referring to equine vets specifically or not. Owners from Villeta highlighted that vets were contactable via telephone.

Leaders from Villeta explained that many vets would end up treating all species of animals, whereas, leaders from Andes explained that vets are usually for small animals. There was an expectation for owners to provide their equids with all necessary treatment and care, instead of seeking professional support.

Leaders in Apartado stated that there are only a small number of equine vets within the region and that they are often too busy to take new clients. Physical access to advanced services, such as complex veterinary procedures, was limited to larger cities, with leaders from Santana highlighting a lack of veterinary equipment in smaller practices within the region. The transportation of equids to these larger facilities was identified as time consuming and expensive.

Limited access to appropriate stabling was a concern for many owners, with women from Apartado, Cartagena and Villeta; leaders from Andes, Apartado, Cartagena and Villeta, and owners from Apartado, Cartagena and Santana highlighting problems with stabling and indicating that stabling should be a priority when providing support for working equids and their owners.

*“We need stables because, as someone already said, some of them don’t have a place for the horses... they get wet and don’t eat well.”- Owner from Santana*

Participants mentioned how this would also allow for increased transparency of equid care and welfare, especially for tourists in Cartagena.

*“We have this problem with a piece of land we are asking for, to make a stable open to the public, so they see what’s going on.”- Owner from Cartagena*

Equids being loose on roads due to having no appropriate place to keep them was identified as a cause of accidents between equids and motorised vehicles in Apartado and Santana.

*“[Equids are] released to wander all over town causing accidents”- Leader from Apartado*

*“A problem could be when they [equids] are on the road because of the cars”- Woman from Santana*

Participants also mentioned poor housing situations and working conditions. Owners in Cartagena stated that there was a high cost of living within the region and that ‘surviving in the city is very hard’. Leaders in Cartagena also discussed the challenges with utilities and food and reported that this resulted in individuals struggling to also feed their animals. It was reported that Covid-19 had further increased the cost of living within some regions.

In Villeta, leaders reported that there were some households with very basic living conditions, with dirt floors, insufficient sanitary facilities, little to no access to clean water, and inadequate space for the number of family members living there. This was linked with problems such as nutritional deficiencies and parasitic infections within these poorer families in Cocorna. Leaders in Villeta also reported poor conditions in working environments including poor sanitary facilities.

### 3.5.1.3 Financial constraints: *“Poorest of the poor”*

Owners from Andes and Cocorna, leaders from Andes, Santana and Entrerrios, and women from Andes, Apartado and Santa Marta highlighted the negative impact that financial constraints have on working equid welfare.

*“I know the case of an owner whose animal got sick and didn’t have any money for treatment or medication and would prefer to leave the horse die because of money.”- Leader from Andes*

These financial challenges resulted in owners being reluctant or unable to take their equid to the vet, purchase veterinary medication and supplements, or provide their equid with sufficient feed. In Cartagena, working equid owners were referred to as ‘the poorest of the poor’.

*“Here we are talking about 12 owners with the financial capacity to self-sustain in the event of a crisis...the others, if I am not mistaken, are very vulnerable families and they are exploited as well as the horses, which is counterproductive.”- Woman from Cartagena*

Participants discussed how the pandemic had caused a decreased amount of investment in equids as a result of the reduced income that owners were experiencing.

*“Now owners don’t have money to feed their animals, so they sell them or put them in paddocks... it has been difficult”- Owner from Villeta*

Many working equid owners rely on tourism and because of the pandemic, this was stopped and participants from Villeta, Cartagena and Santa Marta reported problems with unemployment and financial difficulties as a result of the lack of tourism. Other owners, including those in Entrerrios were able to continue working through the pandemic.

Owners in Villeta reported having to sell their equids during the pandemic because of financial difficulties. Women in Cartagena also described how there had been a loss of previous improvements of working equid welfare as a result of the pandemic.

*“Everything we had won, got lost with the pandemic.”- Woman from  
Cartagena*

Much of the physical environment will impact the opportunities available to working equid owners. The availability of opportunities will consequently affect the ability for owners to elicit certain behaviours and therefore impact the care of working equids.

3.5.1.4 Significant variation in regional and national administration: *“Without police... nothing can be done”*

The local administrations have significant impact on the social environment that working equid owners live in. This can influence the availability of opportunities available to owners. Owners discussed how the local and regional administrations were responsible for increased infrastructure problems including poor road quality and poor human working conditions.

*“If we have a mayor who doesn’t worry about the community... we aren’t going to have a road... we end up walking on trails.”- Owner from Andes*



Owners from Andes, Cartagena and Santa Marta and women from Santana and Cartagena suggested that there was little to no support for both general regional problems and equid related problems from leadership figures including 'Unidades Municipales de Asistencia Técnica Agropecuaria' (UMATA) , national government and regional administration. Owners from Cartagena had a strong negative perception of leadership figures from UMATA, stating that UMATA have not provide any effective support to owners.

*"They [UMATA] check on us to attack us. We are always stressed. We have to look for food for us and for our horses. In my case, I don't think about my family, I think about my horse. That's why we say: we don't want anything to do with the UMATA. I put it this way. If you give that to UMATA to hand it to the coachman, it will never get to us"- Owner from Cartagena*

Leaders from Andes, Cartagena and Santana reported that current efforts to provide support included equid health brigades. Whilst leaders from Cartagena and Andes felt that the current support programmes for working equid owners worked well, owners from Andes highlighted that this support was ineffective and unreliable. Owners from Andes and Cartagena felt that support from leadership figures was patronising.

*"The animal welfare day we did a while ago was very positive and meaningful since we had the participation of many owners of horses... something that I didn't expect, and they were very happy and satisfied, and now they are asking for another one"- Leader from Andes*

*“How much money does the mayor’s office pay a bus to take the brigades to the villages with very little medication for 10 or 12 animals?... so, we don’t even pay attention to those brigades.”- Owner from Andes*

Women and leaders from Santana reported that support from regional and national administration was only available for certain individuals, depending on their political allegiance. Owners believed that the administration only gave attention to problems during political campaigns. The lack of attention given by administrations was identified as a reason why there was little improvement with regional problems such as road quality.

*“In relation to the roads... 2 or 3 years pass by, and they only mention them during political campaigns... other than that mmm.”- Owner from Andes*

*“If they know they can get part of the business, they will do something, otherwise they won’t do anything.”- Owner from Cartagena*

Women in Apartado discussed cases where the administration had ignored events of equid abuse, although some participants suggested that this was due to a lack of police available.

*“There are only four or five policemen in charge of this. Sometimes we call them in case of an emergency and unfortunately, they are in another municipality, and the problem is that the judicial process cannot be carried out, because when there is an event of animal abuse... we are covered by the law... without a policeman in the site, nothing can be done.”- Woman from Apartado*

Leaders from Apartado, Cocorna, Entrerrios and Villeta stated that they wanted to provide support for working equid owners; however, they identified several barriers they had experienced that made this more challenging. Barriers that were highlighted included an absence of finances and resources available to leadership figures; this then made it difficult for them to provide the support for owners. Women from Cocorna mentioned that the regional administrations were not provided with sufficient finances to cover everything. Additionally, members of regional administrations commented on the lack of support they felt they had from the government. Leaders also mentioned that a lack of knowledge of the situation was attributed to the lack of support offered to working equid owners.

*“We lack appropriate spaces to support good animal welfare.”- Leader from Apartado*

*“The administration invests very little due to the lack of knowledge on the matter...”- Leader from Entrerrios*

Leaders from Villeta suggested that training in animal behaviour and welfare would be beneficial. Additionally, leaders from Cocorna felt that there was a need to train members of administration in what to do when there were cases of abuse.

*“I would like to have training on animal welfare, because we have cases in which we have no idea of what to do... if an animal has to be taken away from the owner... we have no training on judicial regulation... we have the case of a cow that rolled downhill and was alive there for four or five days and nothing was done... so we tried to find out what could be done and I was told that we couldn't put her to sleep because the cow had an owner... so at the moment of*

*doing something there are limitations due to the lack of training... at the police station, the same, they don't know what to do... so I would like training and clarity on the subject.”- Leader from Cocorna*

This was also suggested by participants from Apartado who indicated that there was a legal responsibility for administrations to consider the welfare of animals.

*“By law, every administration has to look for animal welfare.”- Woman from Apartado*

*“Although the administration has a major responsibility in this matter.”- Leader from Apartado*

Whilst there was a variety of opinions on the amount of support offered to working equid owners, women from Cartagena and leaders from Apartado highlighted that when support such as farriery training was provided, owners were not always acceptant of this, with some owners becoming aggressive. Leaders from Santana mentioned that owners would not contact veterinary professionals until the situation has worsened and it was too late for any effective support to be provided. Leaders from Cocorna suggested that owners may be unaware of vets that are available to them.

The local and national administration are closely related to the enforcement of laws and legislations. It was suggested that there were situations where enforcement of the rules would help to improve working equid welfare. This was highlighted as important in situations where owners provide little care for their equid.

*“Police, traffic department and the municipality must join forces and begin imposing penalties... because the truth is that there are horses in very bad condition to work and they continue being forced to work. I, as president of the association, tell them nicely, but they don’t pay any attention and continue abusing the animal. If they really begin imposing penalties, things would get better for the horse.”- Owner from Apartado*

Although participants reported that there were some rules and regulations already in place to control equid welfare, they suggested these rules were not always effective and improvements were needed. Women in Cartagena, leaders in Santana and owners in Apartado reported that owners did not always follow the laws and regulations, and further enforcement of these laws was suggested.

*“There was a law... law 84... which has been updated for law 17-74—2016. It is a law with many loopholes and we have problems when seizing an animal for physical abuse.”- Leader from Apartado*

Laws and regulations impact the behaviour of owners and as a result, impact equid welfare.

#### 3.5.1.5 Conformity: *“People will admire the beautiful mules”*

Participants discussed how social pressures could influence the care and treatment of working equids, in particular pressure from tourism. Women from Cocorna and Cartagena suggested that tourists do not care about working equids, despite the introduction of regional rules associated with the weight an equid can carry.

*“The coachmen agreed on having some stickers which said the quota allowed in their chariots, so they didn’t have the responsibility to say “no” to the users, because some used to get angry...well, some of them complained for discrimination...so, the stickers should mention the kilos allowed, not the number of people they can have.”- Owner from Cartagena*

Participants acknowledged that the Covid-19 pandemic had caused a massive decrease in tourism and as a result the demand for working equids had reduced. Participants also explained how the lack of tourism during the pandemic had resulted in a reduction in the owners’ income.

*“Before the pandemic, and this is important to highlight, the coachmen service works with the cruise ships, that increases their income. What happens after the pandemic, obviously, they begin to have economical problem.”- Woman from Cartagena*

*“If we cannot live on tourism during the pandemic, there is no income for the families.”- Leader from Cartagena*

*“Since tourism was closed down, we are doing nothing.”- Owner from Santa Marta*

On the other hand, owners in Santa Marta highlighted how the reduction in tourism resulted in an improvement in working equid welfare. It was identified that equids were no longer working as much and were able to rest.

*“In terms of equids, they have had a long time to rest since there is no work for them.”- Owner from Santa Marta*

There were mixed external perceptions of working equids and the people associated with them. In some regions this perception was mainly positive with participants in Apartado, Andes, Cocorna and Villeta identified that that the public generally appreciates working equids and their owners.

*“In San Francisco you ride a horse out, people make way for you, stand at the corner to see you ride...”- Owner from Cocorna*

*“What you hear from people is that there is a lot of respect for the working animals... they refer to them very affectively.”- Leader from Andes*

However, a negative perception of working equids and their owners was mentioned by owners from Apartado, Cocorna and Cartagena. This was particularly evident in Cartagena where it was highlighted that animal welfare had become a topic of concern.

*“The issue of animal welfare is becoming very relevant, and in Cartagena, there are animal rights activists and with social network... all the animal mistreatment is very visible.”- Leader from Cartagena*

Owners discussed their views on the inaccuracy of how working equids and their owners were presented. Participants reported that they felt they were stigmatised and that there was a lot of misinformation on working equids and the owners. Some participants suggested that this was due to media

manipulation, with owners living in Cartagena stating that animal activists on social media often influenced the public's perception of working equids.

*“And talking about the stigmatization. We focus on working day by day to make a living. We are not in contact with the social media. Who managed our social media and still does it are the so-called Animal Rights Activists, and that's why all the bad things have been generated at a national and international level. We have never paid attention to the social media. We are only interested in providing a good service... that our horses be in good condition. That's our reality.”- Owner from Cartagena*

Both positive and negative perceptions of external stakeholders are likely to influence an owner's motivation to ensure the welfare of their working equids. This may either encourage them to provide appropriate care and treatment for their working equids; or may provide a reason not to.

*“During the festivities here, there is a contest and they get rewards for having mules in good condition... muleteers are encouraged.”- Woman from Santana*

*“Muleteers here are proud of the mules... if their mules are in good shape... they know that people will admire the beautiful mules... there is no animal abuse anymore here.”- Woman from Santana*

Other external influences that were identified by participants included local associations (such as agricultural associations) and other individuals within the community. Owners highlighted the positive support they felt they had from their community.



*“We help each other... many times I have a mule and I say: hey guys! I have this problem... I ask “El Armadillo”, he knows a lot about mules.”- Owner from Santa Marta*

Participants identified that there were associations established for various farming communities including livestock farmers and cocoa growers. However, only participants from Santa Marta reported the presence of an association for working equid owners.

#### *3.5.1.6 Family unity: “We are a team; our families are always there for us”*

Participants across focus groups made it clear that the whole family relied on working equids and that it was common for the whole family to be involved with the work and care of working equids, with owners in Villeta stating that women and children are becoming more and more involved in equid care.

*“If now I need a horseshoe, or serum, or anything, we call home and anyone available will come right away. We all depend on this. We are a team. Our families are always there for us.”- Owner from Cartagena*

Participants across focus groups commented that there was overall equality between men and women. This included equal pay and job opportunities. Leaders in Apartado commented that there were still some jobs that ‘required a lot of physical strength which makes it difficult for women to be a part of.’

There were a variety of roles discussed that women were involved in including childcare, administration, farming, cooking, healthcare, labour and teaching. Some women also stayed at home to do house chores.

Women from Apartado and owners from Villeta commented on increased education and employment opportunities for women, as well as an increasing relevance being given to female empowerment and equality.

*“Now women have the same capabilities and rights when leading processes.”-  
Woman from Apartado*

There were mixed discussions around the involvement of women with working equids. Most participants stated that there was female involvement with equids. Whilst owners from Apartado reported that women worked directly with working equids, most were only involved in routine care. Owners from Apartado and Villeta felt that women were better at handling equids than men, however, leaders from Santana stated that women did not know much about equids or had little involvement with them. Additionally, women in Villeta stated that men were the ones to make decisions relating to equid care and treatment.

*“When I begin to shoe my horses and I am too rough... my wife interferes and scolds me... she is the number one advocate.”- Owner from Villeta*

Participants suggested that there was a lack of general children’s education due to limited opportunities. This was highlighted as more of a problem in rural areas. However, women from Entrerrios suggested that there had been an increase in children’s education and that more children were wanting to study.

Education was identified as a higher priority in urban areas compared to more rural areas in Santana. Leaders in Cocorna, Santana and Santa Marta

suggested that not many children would continue into further education due to a lack of opportunities and a lack of appropriate knowledge to do so.

Owners in Villeta identified that education was important to get a job and that they wanted their children to study. However, in Santa Marta, participants commented on the difference in children's education here compared to other regions in Colombia. Leaders in Santa Marta highlighted that there was less focus on 'western education'.

*"In our community it's not that essential to educate a child... well, he could have some western knowledge, but more than that, he must know his own... we are more interested in a child strengthened in his identity, so he is able to go to school, because all that knowledge coming from outside must be discerned..."- Leader from Santa Marta*

Participants from Apartado, Cartagena, Cocorna, Entrerrios, Santana and Villeta discussed how some children work from a young age, such as helping on farms. Women from Apartado attributed children working to a lack of educational opportunities, whilst others felt children had the choice between working or studying and that many of them wanted to work. Whilst some women from Apartado held the opinion that children should not work, others felt that children working was beneficial as it stopped them from 'taking a wrong path to violence'.

*"The young, nowadays, want economic Independence, so they look for different alternatives to work instead of taking a wrong path to violence... from that perspective, it is something positive..."- Woman from Apartado*

However, owners in Cocorna highlighted that the enforcement of child labour rules meant that minors were not allowed to work.

*“They closed down the business, because there was a minor working there.”-*

*Owner from Cocorna*

Leaders in Santana and Santa Marta commented on a decrease in the number of children studying because of the Covid-19 pandemic. Women in Cocorna and women and leaders in Santana also identified that Covid-19 had caused an increase in children working and helping at home and on farms.

*“Due to the current situation, we are having a lot of school dropouts... I give you an example, now with virtuality they go out to work... get paid and don't want to go back to school... they begin to love money.”- Leader from Santana*

The involvement of children in the care of working equids was reported in Cocorna, Villeta, Entrerrios, Santa Marta and Santana. Participants identified that children living in rural areas 'loved' equids and were routinely involved with equid care, as well as working directly with the equids. Participants also discussed how children had opportunities to learn about equids.

*“I have a six-year-old son and he is excited about saddling the horse... he rides on his own... he loves horses, and like him, there are many children in the countryside... they are very good at handling horses, and the culture is being inherited.”- Owner from Cocorna*

*“The boys begin working at the age of 12 or 15 and they can have their own mules because the work with the mules is well paid.”- Leader from Santana*

3.5.2 Horse-human relationship: *“Some owners have their horses in good condition... but others... tied up on a rope”*

The relationship between equid and owner provides vital insight into the reasons and motivations behind owner behaviour and decision making. There were three sub-themes associated with this over-arching theme:

- Equids aren't sentient: *“Horses are a vehicle... not animals that feel”*
- Care and working ability: *“It's a very important tool”*
- Love of equids: *“I don't think about my family, I think about my horse”*

It was clear there were differing views on the incentives behind wanting to provide good care to equids. The welfare of equids was often attributed to the care they received from their owners, with individual differences subsequently having an impact on the treatment equids received.

*“It is very relative... some owners like to have their horses in good condition and well fed, but others... tied up on a rope or just wandering without any food to eat...”- Owner from Entrerrios*

3.5.2.1 Equids aren't sentient: *“Horses are a vehicle... not animals that feel”*

Owners from Entrerrios, women from Cartagena and Santa Marta, and leaders from Cocorna reported that there were some owners that did not care about their equid and had no motivation to provide them with appropriate care.

*“They are not for animal welfare, they just want to make their money... they don't care if they are doing good or bad.”- Woman from Apartado*

Leaders and women from Cocorna highlighted that some owners did not think that equids were sentient. Participants commented that equids were seen as vehicles and as a result were not provided with appropriate care.

*“Even at times, they become desensitized and see them as a vehicle, and forget that the animal may be in unsuitable conditions for certain works, because they are not given enough food”- Woman from Cocorna*

*“Horses for them are a vehicle... they are not animals that feel...”- Leader from Cocorna*

#### 3.5.2.2 Care and working ability: *“It’s a very important tool”*

Working equids were highlighted as fundamental to the livelihoods of many individuals living in Colombia. Whilst most equids were required for daily tasks, a small number were kept for recreation only. Equids were used for a variety of income generating activities including tourism and crop and material transport. Participants acknowledged the financial stability that equids were able to give to their owners. They also highlighted the importance of equids for some tasks such as extraction of material from rivers in Apartado, and transportation of products over challenging topography in Andes, neither of which would be possible without the support of these equids.

*“As you can see our topography is broken and the mule has been essential for the transportation of our products”- Owner from Andes*

Equids were also associated with important non-income generating activities. In Andes, working equids played an important role in the education of

younger generations by transporting children to school. In Cocorna, equids are used to transport people to hospital as some parts of the region are only accessible by equid.

*“There are places only accessible by mule and as we said before these animals become a means of transportation... as an ambulance”- Woman from Cocorna*

Participants in Andes, Villeta, Cocorna, Santana and Santa Marta identified the link between the condition of the equid and its ability to provide income, and suggested that this provided owners with the reasoning behind providing sufficient equid care.

*“Here, some of us live on mules... it’s a very important tool for the family... so they must take good care of them”- Owner from Andes*

*“Some people here take good care of the animals because they know they are making a living on them”- Leader from Santana*

*“Sometimes the animals are not really cared for... they are provided with the basic things so they can withstand the loads”- Leader from Cocorna*

#### 3.5.2.3 Love of equids: *“I don’t think about my family, I think about my horse”*

A love of equids was identified throughout this study. Owners frequently commented on their appreciation for their equid, with some seeing their equids as *‘a member of the family’*. This was often attributed to the significant role equids play in the owners’ livelihoods.

*“We love our mules as if they were members of our families. When you see that the animal provides sustenance, you learn to love it.”- Owner from Andes*

Owners from Santa Marta felt they had a ‘duty’ to care for their equids. In Santa Marta, owners are perceived to be grateful to their equids for the work they do.

*“We have to look for food for us and for our horses. In my case, I don’t think about my family, I think about my horse.”- Owner from Cartagena*

Equid welfare was reportedly becoming more relevant, with owners caring and loving their equids more than they have previously.

*“30 years ago, a horse was like an object that didn’t feel anything. Now, no... we know they are a living being that feels. We must love them, respect them. The love for the horses has changed 100%”- Owner from Cartagena*

### 3.5.3 Cross-generational knowledge transfer: *“We have to believe the elderly”*

Capabilities were recognised by the physical and psychological abilities of working equid owners and included both knowledge and skills. Inappropriate care and behaviour towards working equids was often linked to a lack of basic knowledge amongst owners. Key areas which lacked a fundamental understanding were nutrition, vaccination, health care and husbandry techniques.

Misinformation was clear throughout focus groups with examples given by participants relating to past experiences and external perceptions.



*“Here, a horse falls down and can’t get back on his feet and everyone speculates...he got a heart attack...cut off his ear” that is what everybody does...they cut off the ear for blood circulation and the truth is that it works out.”- Leader from Andes*

*“These animals that died...didn’t die because of witchcraft...they had the symptoms of “botulism” that can be present in a corn grain...for the ones who don’t know this...they might say that the horses might have been poisoned...they did witchcraft to them...”- Woman from Cartagena*

Knowledge of working equid care was reported as being passed down through generations in Apartado, Cocorna, Entrerrios, Santa Marta, Santana and Villeta, with children learning about equid care and management from their parents. This was linked with the understanding that knowledge was further developed through experience. However, leaders from Cocorna highlighted that ‘anyone could buy an equid’ and that this caused welfare problems as some owners had no previous experience or knowledge of equids.

Leaders suggested that owners did not have appropriate equid handling skills. This included owners not knowing how to inject equids and owners having more difficulty handling mules in comparison to other types of equids. In Cocorna, leaders suggested traditional muleteers knew how to shoe an equid very well, but that there had been a decrease in farriery skills over time.

Training was requested by participants throughout focus groups. This included training on handling of equids and basic care, such as appropriate nutrition, management practices and an understanding that equids are sentient.

*“To give general training on equids... first aid, how to take good care of them,  
health care...” – Owner from Santana*

*“We need to raise awareness that the animal gets tired just as much as we  
do... when the horse is tired, don’t force him to work hitting him with a shovel,  
a chain or a rope.”- Owner from Apartado*

#### 3.5.4 Traditional management practices: *“Fill a rucksack with wet ashes”*

Participants discussed the relationship between working equid welfare and the treatment equids receive from their owners. The treatment working equids receive is ultimately a result of the behavioural choices and decision-making processes of their owners.

Participants discussed the link between the decisions made by owners, the management practices used, and the treatment and welfare of these equids.

One aspect of equid management that was discussed by participants was nutrition. Women from Santana, Santa Marta and Villeta, leaders in Apartado, Santana and Villeta, and owners from Cartagena, Entrerrios, Santana and Villeta all commented on nutritional associated problems. This included both underfeeding or not feeding at all, and equids being fed inappropriate diets, which in some cases led to an increased risk of equine colic. Owners from Cartagena reported they had been able to improve their understanding of equine nutrition following training courses provided within the region.

Other aspects of equid management that were highlighted included saddlery and farriery. Whilst there was variation between individuals current knowledge of these, many participants suggested that these were all areas that needed improvement.

Owners in Santa Marta highlighted that it was not only owners who were responsible for the care of working equids. Muleteers work with the equids but may not own the equid. Muleteers work is often thought of as traditional work. Muleteers will therefore also have some responsibility of care for equids. Owners in Santa Marta reported that muleteers did not treat the equids as well as owners, whilst leaders in Cocorna felt that traditional muleteers had a better understanding of equid care.

*“The muleteer...as everything, sometimes makes mistakes... you know, it is work and at times you get angry, but as an owner you try to do your best with the animal.”- Owner from Santa Marta*

Participants from Cartagena, Cocorna, Entrerrios, Santana and Villeta also mentioned overloading. Owners from Entrerrios explained that equids can carry between four and six cans of milk, with each can weighing around 45kg. However, some owners from Entrerrios felt that any more than four cans of milk would be too much and reported welfare concerns associated with equids carrying heavy loads.

*“A friend of mine is very sad, because he was coming down with his horses loaded with six cans of milk and a leg broke”- Owner from Entrerrios*

Participants identified a range of health problems seen amongst the working equid population. These included colic, lameness, dental problems and skin problems. Some owners also identified how the management decisions they made influenced the welfare of their equids.

*“If a horse limps it is because he was badly shod.”- Owner from Entrerrios*

One owner from Apartado explained that they lack the knowledge of what is causing colic in their equids.

*“Yesterday, we had the case of a horse that die of a “tambora” [colic] and we cut open the horse and saw the problem... we are always guessing... it would be nice to have a place for exams and so on.”- Owner from Apartado*

The treatment methods for these conditions varied between communities, but many owners reported the use of home remedies. Common treatment methods used for equine colic included beer, salt, and urine. Other treatment methods included honey, honey water, 'guacimo' (a type of plant), or chlorine in Villeta; mineral oils and soap solutions administered rectally, ACPM (engine fuel oil), fig tree oil, or plant waters administered orally in Santana; and aralen (a bitter plant also recommended for the use in humans), pig faeces, "mata raton" (a type of plant), mashed garlic mixed with soap, oil and warm water administered rectally, and filling a rucksack with wet ashes and hitting the equid with it in Santa Marta.

*"Fill a rucksack with wet ashes and hit the mule with it"- Leader from Santa  
Marta*

A small number of participants discussed the use of veterinary intervention and treatment, including the need to contact a vet in cases of severe colic in Cocorna, and the use of Buscopan in Entrerrios and Santa Marta, or Finadyne in Santana.

Lameness was another common concern raised by working equid owners across communities. In Entrerrios owners reported removing the equid's shoes and allowing them to rest in order to treat lameness. Owners in Cocorna used petrol with or without salt; and owners in Santa Marta described using a knife to burst hoof abscesses and using gasoline to burn the hoof.

*"First I take the hoof and hit it, if she moves the leg, I know is right there... and I start hitting it with the tip of a knife and sometimes it bursts or at times I*

*burn it with ACPM or gasoline and once burned, it heals.”- Owner from Santa  
Marta*

In cases of “hormiguillo” (white line disease) owners in Villeta used chlorine, ACPM (diesel) , water and soap, or muriatic acid; women in Santa Marta reported owners used bleach, battery acid, or ACPM with ivermectin; and owners in Santa Marta describes removing affected tissues, and using gasoline and melted hosepipe.

*“We do the basic for “hormiguillo” ... excavate the place in the hoof where it is, because we don’t have anything... so we excavate a lot, but that part must be burnt... take some cotton with gasoline, put it on the spot and light it, so it gets hot and then cover it... that’s our custom... we have to believe the elderly... someone once told me that when the hoof is decayed and with holes in it... clean it well, take a piece of hose and burn it, and fill in the holes with it and it seals, so that helps while the hoof is renewed.”- Owner from Santa  
Marta*

Owners in Santana stated that they would use “Livanal” (iodine solution) or “Criolina” (disinfectant) to treat hormiguillo in their working equids.

Whilst there are lots of problems with working equid welfare that have been highlighted throughout focus groups, it was also reported that there had been an overall improvement to working equid welfare.

*“Comparing 15 years ago, horses now are 95% better off. In the past we used to see very skinny horses. Now, even with the pandemic, you don’t see weak horses and we are not hiding anything, anyone can see it. I think that the best time for the horses has been the last 10 years. Before, the horse used to look*

*for his own food, now we feed them. They are sheltered... with good water. The horse knows when it's time to work. Things have been changing.”- Owner from Cartagena*

Leaders from Andes, Apartado, Cocorna and Santana and women from Apartado, Cartagena and Villeta commented on the presence of intentional physical abuse of working equids. This included reports from leaders in Apartado and Santana of beating of equids with shovels, ropes, canes.

*“We have had cases of animals being beaten with shovels and ropes”- Leader from Apartado*

Participants from Apartado indicated that this was more commonly seen from younger generations of equid owners and women in Cocorna and Villeta mentioned that in some cases equid abuse was linked to alcohol consumption.

In contrast, women from Entrerrios and Santa Marta reported that they did not ever see intentional physical abuse of working equids within the region.

## 3.6 Discussion

### 3.6.1 Overview of findings

This study aimed to explore the factors that influence working equid welfare in Colombia through focus groups with a range of stakeholders. The study identified a range of factors that contribute to working equid welfare either directly or indirectly.

The external environment that equids and their owners live in present specific challenges that impact the decisions made by owners. Key aspects of the physical environment, include the challenging topography and poor road quality. This makes accessing services such as human and animal health care extremely difficult. This challenging physical environment increases the need for working equids as a source of transportation. The external environment affects the owners' access to utilities and resources, and provide appropriate management for their equids; for example, the availability of clear water sources will impact the quantity and quality of water owners are able to provide their equids. Financial concerns are a key consideration within working equid owning communities, with many families experiencing financial difficulties. The external environment covers a range of factors that make life difficult for working equid owning communities. These factors increase the reliance on their equids, whilst also making it difficult for them to provide key aspects of care for them.

The social environment influences an owner's internal beliefs and expectations, as well as their opportunities and ability to carry out certain behaviours. This study identified three areas of the external social environment: the regional and national administration, the perceptions and impact of other external stakeholders including tourists and the general public, and the family structure within these communities. These could be both barriers and facilitators. The family structure and community life often held the working equid as an essential and valued component, which is a key facilitator to improving equid welfare.



The testing external environment identified throughout this study highlight the extent to which these communities differ to the environment of equid owners in more developed countries. This shows the extensive list of additional considerations that working equid owners must negotiate on a daily basis.

The external environment is a major factor affecting these communities, and their management decisions, and will require major funding and infrastructure to change it. This study however also highlighted the influence of internal factors, such as individual motivation and the horse-human relationship. Throughout the different focus groups, three perceptions on the relationship between equid and owner were seen. Each of these perceived relationships provides reasoning behind the management decisions made by owners. Some participants felt that equids were thought of as vehicles, and did not require proper care. Other participants highlighted the need to provide a basic level of care for their equid in order to ensure that the equid was capable of working and providing a source of income for their owners. Whilst these two perceptions highlight the use of equids as a tool for their owner, other participants felt a deep affection for their equids, and in some cases thought of them as a family member.

The knowledge and skills obtained by working equids was one of the biggest contributors to their management decisions and therefore the welfare of their equids. Intergenerational cultural transmission including the beliefs, knowledge and accepted practices within these communities was seen throughout the focus groups. The understanding of how to appropriately care for equids was passed down generationally and modified slightly through personal experience. This led to misinformation and misunderstanding being seen throughout focus groups. A huge range of management practices were seen, including a variety of treatment methods for common health problems. This study highlighted the complexity of working equid owning communities and helped to map each of the contributing factors for equid welfare. This can allow owners and their equids to be better understood and supported.

### 3.6.2 Study design and methodology

The qualitative nature of this study allowed for appreciation of the complexity of human behaviour and human-animal relationships. Focus groups were used as they facilitated the possibility of gaining opinions from a larger number of participants. Interviews would have also been an appropriate option, but the limited time and contact between owner and charity staff meant that focus groups are more efficient use of time. Along with this, the use of focus groups encouraged active participation by owners, with the added benefits of group dynamics facilitating increased discussion points (Krueger, 2014).

There are additional important considerations to make when conducting focus groups in low- and middle-income countries such as Colombia. Much focus has been put on the practicality differences such as language barriers, informal meeting spaces and individuals leaving or joining focus groups throughout (Hennink, 2007). However, beyond this, cultural differences, steep participant-researcher power gradients and conversational norms must also be taken into account (Jakobsen, 2012). Throughout this research, researcher-participant relationships were key to gaining trust and allowing participants to feel comfortable discussing all questions. This along with increasing participant-participant interactions helped to give participants more control. The considerations of conducting cross-cultural research are explored in more detail in the final discussion of this thesis.

This study aimed to gain views from a range of stakeholders, including individuals who held leadership roles within the communities. Power dynamics within a focus groups can result in self-censoring, increased conformity, lack of active participation and unrepresentative perceptions (Stewart and Shamdasani, 2014, Greenbaum, 1998, Bloor, 2001). One way to lessen the dynamics of power is through the selection of participants who view each other as similar (Carey and Asbury, 2016, Greenbaum, 1998). Participant allocation into three groups helped to provide a safe environment for participants by reducing power dynamics between different stakeholders

(Krueger, 2014). Anecdotally, running a female only focus group was extremely beneficial in some communities, with researchers involved in this project noticing a significant difference in active participation from females once given the opportunity to engage in an environment separate from males. Gender inequality continues to be a problem worldwide, with Colombia being no exception (Human Development Reports, 2021). Research has explored the importance of working equids in the lives of women along with the roles women have in caring and working with these equids (Valette, 2014b, Haddy *et al.*, 2020b). By carrying out specific focus groups with only women, it was hoped to increase their willingness to contribute and reduce any power dynamics that may have been present in a mixed-gendered group.

### 3.6.3 Key findings

#### 3.6.3.1 One welfare and working equids

The One Health concept was originally developed to highlight the link between human and animal health including infectious disease. One Health highlights the close relationship between human and animal health and aims to advance human and animal health worldwide (Mackenzie and Jeggo, 2019). Some elements of animal welfare are considered in the One Health framework, but it wasn't until the One Welfare framework was developed that human and animal welfare was fully considered. In addition to the relationship between the health of animals and humans, the one welfare framework illustrates the links between human livelihoods, animal welfare and the wellbeing of the environment (Pinillos *et al.*, 2016). Examples of topics relevant to one welfare can be seen in Figure 10.



Figure 10: Overview of the one welfare framework showing examples of relevant topics (Pinillos *et al.*, 2016).

Improvement of animal welfare requires a multidisciplinary approach taking into account the scientific, ethical, economic, religious, cultural and international policy aspects (Bayvel and Cross, 2010). Consideration of health and welfare as one, with the interactions between human, animal and environmental factors can help to provide a more in-depth understanding of a situation, with focus on the context; and can allow the development of a solution-orientated approach to improving health and welfare (Jordan and Lem, 2014).

A One Welfare approach is perfectly suited to working equids and the communities that rely on them. The high reliance of owners and their families on their working equids is a key component to consider in all research and interventions involving the welfare of these animals and the livelihoods of their owners. Owners depend on their equids for financial stability and overall livelihood satisfactions (Haddy *et al.*, 2021b, Geiger *et al.*, 2020, Dijk *et al.*, 2011), with equids contributing to a huge number of daily tasks (Valette, 2014b). This can provide owners with physical support for transportation of crops and materials (Upjohn and Wells, 2018, Arriaga-Jordán *et al.*, 2005), offer an opportunity to earn regular, reliable income (Valette, 2015, Admassu and Shiferaw, 2011), and access services such as human health care and education (Costa Rica Equine Welfare, 2023, International Coalition of Working Equids, 2023, Admassu and Shiferaw, 2011). For some families, their equid is vital for almost every aspect of their lives. Working equids also rely on their owners for general survival. A One Welfare approach has been seen when discussing working equid welfare across various working equid populations (Kubasiewicz *et al.*, 2022, Rodrigues *et al.*, 2020, Watson *et al.*, 2020, Haddy *et al.*, 2020b, Vasanthakumar *et al.*, 2021). The importance of a one welfare approach to working equid welfare was clear throughout this study. The welfare of working equids in Colombia is largely reliant on the behaviour and decisions made by their owners. These owners are influenced by the social and physical environment in which they live and work. This environment determines what behaviours are feasible. The welfare of

working equids determines their working ability and consequently their earning potential. The income derived from working equids will impact their owners financial stability. This will determine whether the owners are able to provide their families with food, shelter and other basic needs including health care and children's education. Mapping out the contributing factors of working equid welfare, allowed this study to explore the wider picture within these communities; this provides a broader range of possible support for working equids and their owners.

#### 3.6.3.2 Use of theoretical underpinnings

During the analysis of this study, the COM-B model of behaviour was used to support data analysis. The COM-B model of behaviour is one of many human behaviour models that is frequently used to understand the drivers behind behaviour and decision-making. This model identifies three key components that must be present for a behaviour change to occur: capabilities, opportunities and motivation (Michie *et al.*, 2011)[Figure 11]. Capabilities consist of both physical and psychological aspects that along with opportunities facilitate the possibility that behaviour can occur. Psychological capabilities involve an individual's knowledge, memory and psychological stamina. Physical capability refers to an individual's physical strength, skill and stamina. Physical and social opportunities influence how achievable a certain behaviour is. Physical opportunities are provided by the environment and consist of time, location, finances and the availability of material resources. Social opportunities result from social and cultural norms. Motivation is also made up of two components that together refer to an individual's internal processes that direct decision-making and behaviours. Reflective motivation consists of reflective or conscious processes, including making plans and evaluating events. Automatic motivation involves automatic processes such as instincts, impulses and internal desires.

The greater the opportunities and capabilities, the more likely a behaviour is to occur; however, even with both of these, if there is no motivation to carry out the behaviour, then it will not occur. In contrast, an individual may have

the capabilities and motivation and so will seek out the limited opportunities to engage in a behaviour change.

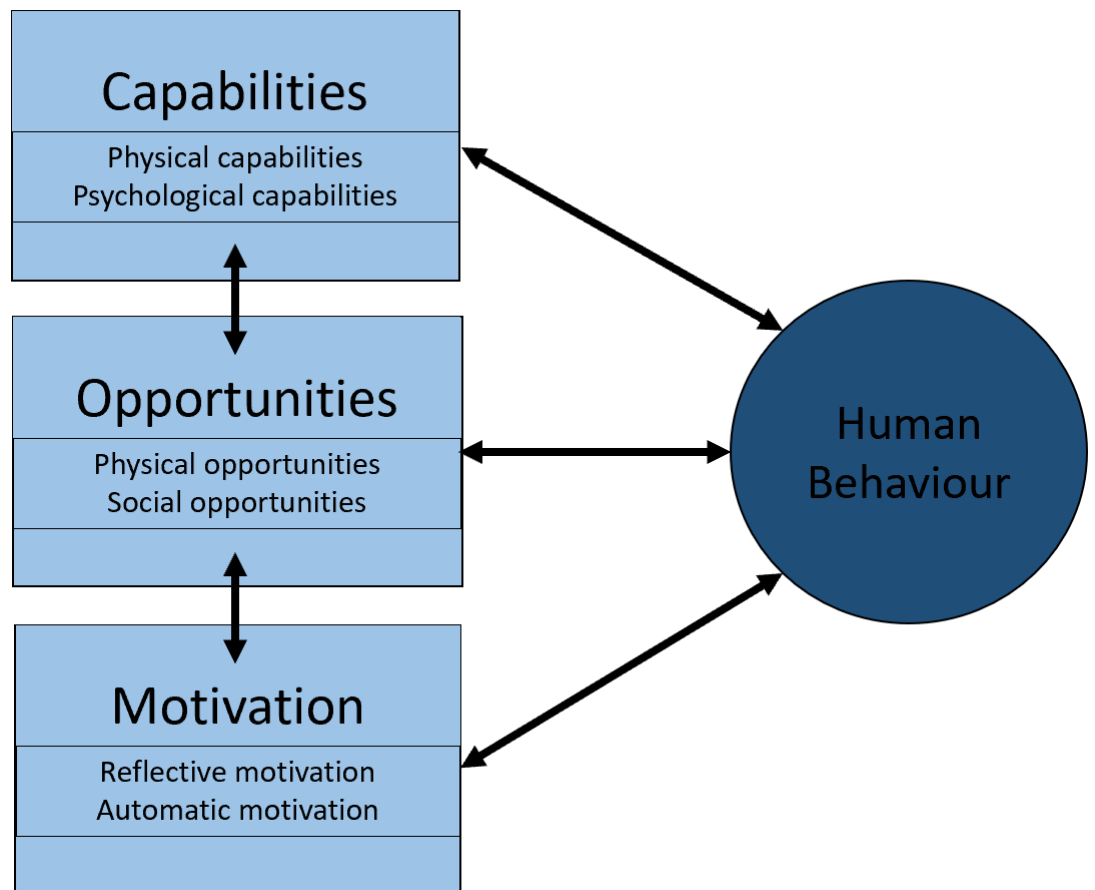


Figure 11: The COM-B model of behaviour change showing the components of capability, motivation and opportunity that contribute to human behaviour (Michie *et al.*, 2011).



Human behaviour change models such as the COM-B model have facilitated research and intervention development within human medicine for years (Jepson *et al.*, 2010), and more recently in animal welfare research (White and Rogers, 2017, Furtado *et al.*, 2022, Wolframm *et al.*, 2023). The COM-B model is well-recognised and allows evaluation of human behaviour through consideration of a huge multitude of factors, including the influence that external factors have on behaviour (Michie *et al.*, 2011).

One study conducted in the UK explored the use of community engagement within a socio-economically disadvantaged community in relation to free-roaming domestic cats (McDonald and Clements, 2019). The COM-B model was used to help identify barriers to support these cats within these UK communities. The presence of external barriers within socio-economically disadvantaged communities are highlighted through models such as COM-B, which is vital when considering how best to support these individuals. This is similarly reflected in research conducted in low- and middle-income countries (Evans *et al.*, 2022). One systematic review investigated the use of behaviour models in the development and implementation of interventions in low- and middle-income countries. Whilst this review identified a number of models used, all models revolved around the three central components of opportunity, ability and motivation (Evans *et al.*, 2022). Evans *et al.* (2022) concluded that the use of these three components allowed research findings to be practically used to develop supporting interventions.

Many working equid owning communities are based in low- and middle-income communities and owners often face a huge number of external challenges (Haddy *et al.*, 2021b, Burn *et al.*, 2010a), which was reflected throughout this study. These external factors may be extremely challenging or even impossible to change and interventions must be considerate of this. For example, increased awareness of the importance of prophylactic treatments such as worming will have a positive impact on an owners capabilities and knowledge but if these treatments are not physical available, behaviour change cannot occur. The COM-B model helps to explain the feasibility for

change to occur and can be used to identify specific components that may be preventing individuals to alter their behaviour (Michie *et al.*, 2011). For this reason, the COM-B model of behaviour was selected to support the analysis of this study. Three of the overarching themes identified in this study reflect the components of the COM-B model and have been modified to relate to these specific working equid owning communities. The theme 'Testing external environment: "Surviving... is very hard"' includes social and physical environmental factors that contribute to the 'opportunities' component of the COM-B model. The themes 'Horse-human relationship: "Some owners have their horses in good condition... but others... tied up on a rope"' highlights the influence of the horse-human relationship and demonstrates different aspects of motivation. The theme 'Cross-generational knowledge transfer: "We have to believe the elderly"' describes owners capabilities and knowledge. These three themes interact to result in the behaviour and management practices that are identified in the final overarching theme 'Traditional management practices: "Fill a rucksack with wet ashes"'.

### 3.6.3.3 External environment of working equid owning communities in Colombia

This study explored various stakeholder perceptions of the external environment across eight communities in Colombia. It was clear that the external environment influenced working equid owner lives and consequently animal welfare. The theme ‘Testing external environment: “Surviving... is very hard”’ incorporates the social and physical environments of working equid owning communities and is reflective of the opportunities component of the COM-B model (Michie *et al.*, 2011).

There is limited research on the external environment of working equid owning communities. Haddy (2022) explored the environmental factors that influenced working equid welfare, which was largely focused on the direct impact of climate and temperature. High temperatures and wind speed were associated with increased shelter seeking behaviour in equids, implying the importance of shelter provision for equids living and working in harsher climates (Haddy, 2022, Haddy *et al.*, 2020a). This study conducted by Haddy *et al.* (2020a) investigated equids at two locations in Spain, both of which were sanctuaries which reduced the generalisability of the findings from this study. In Nepal, equids were required to carry loads along narrow bridges, rivers and steep slopes, which required a lot of training for them to become used to doing so (Watson *et al.*, 2022). Watson *et al.* (2022) reported that during the monsoon season, the work was extremely difficult and the severe flooding could result in fatalities for equids and owners. In Pakistan, researchers reported that road quality is poor, which can often cause donkey carts to break (Kamran *et al.*, 2022). The external environment of working equid owning communities will vary massively due to the wide spread use of these animals and therefore, working equid research is not always generalisable beyond the context of each study. However, findings from Watson *et al.* (2022) and Haddy *et al.* (2020a), along with findings from this study in Colombia, highlight the important consequences that the physical environment can have on working equids.

Beyond working equid welfare, the external environment can impact the livelihoods of working equid owners. Through reduced opportunities this can then have an indirect impact on the care equids receive, and therefore cause further welfare concerns. The challenging topography was discussed frequently with participants stating that it both increased the need for working equids and increased the challenges associated with caring for these equids. This along with poor road quality made transportation very difficult. The need for equids within this context is made clear, with other motorised options being impractical. Just under 20% of Colombia's population live rurally and are likely to face similar problems associated with topography and road quality; however, those individuals who do not own working equids may face even more challenges (The World Bank, 2021c). Participants discussed how working equids acted as ambulances in some situations, which highlights the importance of these animals to the wider community. By exploring the challenging physical environment many of these owners live in, it is very clear why equids are so important to the day to day lives of all those living within these communities. There is a lack of research into the external environment of working equid owning communities in Colombia specifically. However, this study begins to build a better understanding of the context of these communities.

Colombia has a population of just over 52 million (Worldometer, 2021), with an estimated 6.6% of the population living below the international poverty line (earning less than US\$2.15 per person per day)(World Bank, 2023). Working equid owners in Colombia are some of the most vulnerable individuals with one study estimating that two thirds of working equid owners in Colombia were living in poverty in 2018 (Burford, 2019). The proportion of working equid owners living in poverty is disproportionate to the general population and highlights the financial challenges that these owners face. Financial constraints were discussed throughout this study with participants referring to working equid owners as 'the poorest of the poor'. Participants within this study reported that a lack of financial resources resulted in

working equids missing out on vital aspects of care, such as veterinary treatment.

Access to basic resources was another concern for some participants throughout this study. It is estimated that 93% of individuals living in Colombia have access to clean drinking water (Gobierno de Colombia, 2021). However, other studies conducted in Colombia have found that 88% of water samples taken from rural communities were classified as high risk (Galezzo and Rodríguez Susa, 2021). Having only been conducted across two regions, these results are not representative of Colombia as a whole; however, this does highlight that certain regions will likely have significant difficulty accessing clean drinking water.

Throughout the study in this chapter, there were regional differences seen with water access and quality. There were also differences seen between leaders, women and owners perceptions in regards to water access. This was highlighted in Santana, where leaders reported that villages had access to water systems; whereas, women within the same region stated that whilst the administration had built a water supply, that it was ineffective and the water was dirty. There are a number of reasons that may have led to the contrasting perception on water access and quality within Santana. This could include variation within the region, or a lack of understanding from participants. However, regardless of why there are differences in perceptions, it is vital to consider the consequences for those who do not have access to sufficient water resources.

A lack of sufficient water resources will increase the risk of human health problems, such as waterborne diseases (Adams *et al.*, 2020). Gastrointestinal diseases including those caused by the consumption of contaminated water can be extremely severe, which along with poor access to human health care can result in high rates of fatalities amongst these vulnerable communities (World Health Organization, 2023). Both a lack of clean drinking water and insufficient human health care were reported within the working equid

owning communities within this study. This emphasises the vulnerability of working equid owners within Colombia.

Communities with insufficient water resources for human consumption, are likely to also experience challenges with providing sufficient clean water for their animals. A lack of, or the consumption of dirty water can result in animal health problems such as colic (Reeves *et al.*, 1996, Kaya *et al.*, 2009). Again this can be extremely severe and a lack of access to veterinary support is likely to exacerbate the problem. External factors such as water resources will have a significant impact on working equid welfare and owner livelihoods. Exploring the context of communities is important to identify factors such as this, which can allow the development of targeted, effective support and interventions aimed at these equids and their owners.

#### 3.6.3.4 Importance of human-animal interactions within a working equid setting

Throughout this study the importance of the relationship between human and equid has been identified. It was clear that owners rely on their working equids for a number of daily activities. This importance has been seen across a vast number of working equid populations across a range of environments (Pritchard, 2014, Maichomo *et al.*, 2019, Valette, 2015, Admassu and Shiferaw, 2011). Whilst the type and amount of work differs between populations, this reliance is consistent throughout and the welfare of these animals is key to the lives of their owners.

Participants expressed a number of reasons behind wanting to provide equids with appropriate care. These included:

- Equids aren't sentient: "Horses are a vehicle... not animals that feel"
- Care and working ability: "It's a very important tool"
- Love of equids: "I don't think about my family, I think about my horse"

These three sub-themes highlight how owner motivation may differ between individuals. It is concerning that there were a number of comments from participants that highlighted a belief that equids were not sentient. Haddy *et*

*al.* (2023b) reported that owners who did not feel that their equids experiences emotions owned equids with a poorer general health status and poorer body condition score. Consideration of these individuals in future support provision is vital as their equids may be experiencing the most compromised welfare.

Regardless of an owners belief of the level of pain or emotions working equids experience, there is an important link between equid welfare and their working ability. The importance of working equids to their owners livelihoods is clear, and the consequences of poor equid health are often severe (Bonsi *et al.*, 2023a, Admassu and Shiferaw, 2011, Angara *et al.*, 2011, Bekele *et al.*, 2014, Molla *et al.*, 2021). One critical review explored the socioeconomic impact of disease in working equid populations (Bonsi *et al.*, 2023a). This review concluded that disease in working equids can cause significant detrimental effects on the livelihoods of their owners, through income loss, reduced access to water, food insecurity and a build-up of undisposed waste.

This link could be used to encourage working equid owners to improve the care of their animals in order to avoid such socioeconomic consequences. Throughout this study, participants across regions in Colombia, identified this need to provide their equids with appropriate care in order to ensure they are able to continue working. This was seen on a scale ranging from providing their equid with the bare minimum needed to avoid their perception of poor health, to a deeper understanding that owners need their equids and learnt to love equids out of necessity.

There were a number of participants who expressed a more emotional attachment between owner and equid. Some owners convey a deep affection for their equids with some referring to them as a family member. Aspects such as empathy and attitudes towards non-human animals have been found to have a significant impact on human-animal relationships and overall animal welfare (Hanna *et al.*, 2009, Kielland *et al.*, 2010, Muri *et al.*, 2012, Lanas *et al.*, 2018, Brizgys, 2018, Hemsworth *et al.*, 2015, Luna *et al.*, 2018, McGowan *et al.*, 2012). Whilst many of these studies focus on livestock or companion

and sport horses, there are still similarities seen with the findings from this study conducted in Colombia.

One study conducted in the UK explored the horse-human relationship and investigated how this influenced owner decision making in regards to key events in their horses lifetime (Clough *et al.*, 2021). This study found that horse owner motivation behind decision making varied. Some horse owners prioritised the use of the equid and prioritised the 'job' the equid was purchased for. Whereas, other horse owners emphasised emotional connection and referred to their horse as a member of the family. Whilst this study was conducted in a completely different setting to those of working equids in Colombia, it is interesting to see parallels with the variety of perceptions of the horse-human relationship within these two contexts.

#### 3.6.4 Future recommendations

Without understanding with context of the problems that working equid and their owners face, it is not possible to develop methods to overcome them. This study highlighted the importance of considering the social and physical environment, along with human livelihoods and equine welfare. These external factors must be considered in the future. By focusing solely on working equid welfare, the outcomes of research and support are limited.

Working equid studies are only generalisable to the context in which the study is conducted. Some findings may be relevant to other populations; however, the range of environments in which working equids are found varies too dramatically for findings to be generalised. It is not possible to include working mules used in brick-kilns in Nepal with horses used for tourism in the tropics of South America. These animals would live entirely different lives and should not simply be grouped under the same umbrella term of 'working equid'. Future research and intervention development needs to be aware of the specific context in which they are working, which will then allow a better understanding of what aspects each equid population shares or differs. Only by understanding the environment of specific populations of working equids is it possible to provide appropriate and effective support.



### 3.7 Conclusions

This study aimed to explore the factors that influence the welfare of working equids and the livelihoods of their owners in Colombia. There were four overarching themes identified throughout this study: 'Testing external environment: "Surviving... is very hard"', 'Horse-human relationship: "Some owners have their horses in good condition... but others... tied up on a rope"', 'Cross-generational knowledge transfer: "We have to believe the elderly"', and 'Traditional management practices: "Fill a rucksack with wet ashes"'. These four themes interact with one another to show how each aspect of the environment interacts with owner behaviour and decision making, and the care and welfare of working equids across Colombia.

The external environment was made up of both the physical and social environment and included topography, road quality, utilities, finances, regional and national administration, external perceptions and the family structure. Each of these components impacted the opportunities and quality of life of owners, with some having the potential to directly impact working equid welfare. The relationship between equid and owner provides vital insight into the reasons and motivations behind owner behaviour and decision making. It was clear there were differing views on the incentives behind wanting to provide good care to equids. This will directly impact the welfare of equids within these communities. Owner knowledge and capabilities were highlighted with inappropriate care and behaviour towards working equids often attributed to a lack of basic knowledge amongst owners.

Understanding decision-making processes and behavioural patterns of owners, and external influencing factors is essential in improving the impact of support provided within these communities.

## 4 Exploring the knowledge and perceptions of equine colic within working equid populations in Colombia

### 4.1 Abstract

Working donkeys, mules and horses are estimated to make up 92% of the equid population worldwide, and yet, these working animals are often excluded from research, legislation and interventions. The welfare of working equids is frequently compromised, with colic reported as a common problem. There is little evidence exploring colic within working equid populations.

This study explored the current knowledge and perceptions of equine colic in five working equid owning communities across Colombia. Surveys were conducted in Spanish by in-country researchers in September 2022.

Descriptive analysis was carried out on all data.

Forty percent (n=23/58) of owners had experienced one or more episodes of colic with their equid(s) within the 12 months prior to this survey. Seventy-eight percent (n= 39/50) of participants stated that colic was always, often or sometimes fatal. Forty percent (n=17/42) of participants experienced an equid die before or without treatment and 36% (n=15/42) experienced an equid die during or after treatment. The most frequent sign of colic reported by owners was rolling (76% n=44/58), followed by walking/ circling (60% n=35/48), lying down (47% n=27/58) and pawing at the ground (33% n=19/58). The most commonly reported risk factors associated with colic were ingestion of contaminated feed (53% n=31/58) and feeding inappropriate food (52% n=30/58). The most common treatment method was beer (64% n=37/58). Other treatments included avocado (19% n=11/58), urine (14% n=8/58) and cooking oil (14% n=8/58).

Equine colic is a significant welfare concern for working equids in Colombia. There are high owner reported prevalence and mortality rates, and a lack of appropriate treatment methods. These factors have a major welfare impact, and highlight the importance of colic prevention within these communities.

Contributions to chapter:

Data collection was conducted by staff members and students from Universidad de CES (SH, MC, DO) and Fundación Arrieros Colombia (CJ, SP). All other aspects including the development of the questionnaire, briefing for data collection, and data analysis were conducted by the primary researcher (JB).

## 4.2 Introduction

The term colic is used to describe generalised abdominal pain in equids (Hackett, 2013). There is an abundance of underlying causes of abdominal pain in equids, with acute gastrointestinal disease the most frequent within domestic equid populations (Curtis *et al.*, 2015). Colic can be severe and require immediate veterinary intervention (Bowden *et al.*, 2017). Without appropriate treatment colic can be fatal and remains a major welfare concern for equids (Curtis *et al.*, 2015, Mair and Smith, 2005). There are a huge number of risk factors associated with equine colic (Curtis *et al.*, 2019). Management associated risk factors include feeding and nutrition (Cohen *et al.*, 1999, Cohen and Peloso, 1996, Cohen *et al.*, 1995, Salem *et al.*, 2017, Scantlebury *et al.*, 2015a), and access to water. In addition to this, environmental factors such as seasonal changes (Archer *et al.*, 2006), weather patterns (Cohen *et al.*, 1999) and geographical location (Archer *et al.*, 2014) can impact the risk of equine colic.

Whilst the incidence of colic within working equid populations is largely unknown, it has been highlighted as a problem faced by working equids across the world (Wild *et al.*, 2021a, Stringer *et al.*, 2017, Salem *et al.*, 2017, Mohite, 2014) with some of the limited studies suggesting a prevalence of up to 55% of working horses having experienced one or more cases of colic within a 12-month period (Salem *et al.*, 2017). Colic was also identified as a concern in working equid owning communities in Colombia by participants within Chapter Three of this thesis.

Working equids face additional challenges that result in a variety of additional risk factors associated with colic. A large number of working equids live and work in warmer countries where the high temperatures, heavy workload and low availability of water generate a high risk of dehydration and consequently colic (Pritchard *et al.*, 2007, Mohite, 2014). Working equid owners are unlikely to have access to mineral sufficient concentrate feed or nutrient rich pastures. Instead, owners rely on simple feeds such as ground corn, which has

also been associated with a higher risk of colic (Salem *et al.*, 2017). Increased rates of intestinal obstruction and impaction as a result of consuming inorganic materials and plastic have also been seen within working equid populations (Mirazo *et al.*, 2012). With the number of risk factors of colic that working equids are exposed to regularly, it is unsurprising that colic is a major problem seen within these populations.

It is vital to provide owners and their equids with the support needed to reduce the risk and consequences of equine colic. Provision of practical advice around preventing and managing colic in working equids requires an understanding of the current knowledge of colic and how it is identified and managed within working equid communities.

### 4.3 Aims and objectives

The aim of this study was to explore the current knowledge and perceptions of equine colic, and to identify potential risk factors for the development of colic in working equid communities.

The objectives of this study were:

- To collect demographical data from five different working equid communities in Colombia using a verbal questionnaire
- To identify the current level of knowledge of the causes, signs and treatment of colic in working equid owners across five communities in Colombia using a verbal questionnaire
- To identify current management practices in working equid communities relating to nutrition, water provision, worming, and workload of working equids across five communities in Colombia using a verbal questionnaire

## 4.4 Methods

### 4.4.1 Sample population

Five communities across four regions in Colombia were selected: Apartado, Andes, Cocorna, Santa Marta - Kütünsuma and Santa Marta - Machete Pelao [Figure 12]. These communities were purposively selected to represent a heterogeneous range of environments. An overview of each community is given in the appendices [Appendix VI].



Figure 12: Map of Colombia showing the five communities (Andes, Apartado, Cocorna, Santa Marta- Kütünsuma and Santa Marta- Machete Pelao) in which a baseline colic survey exploring the current knowledge and perceptions of equine colic was conducted.

#### 4.4.1.1 Participant recruitment

Participants were recruited by convenience sampling within each community. Information about the survey, which was to be conducted at a planned health brigade was communicated to equid owners who had participated in previous research studies or visits carried out by Universidad de CES and Fundación Arrieros Colombia via WhatsApp or telephone call. All owners attending health brigades were invited to participate in the survey. Participants were required to have current or previous involvement with working equids and be over the age of 18. There were no limits on the maximum or minimum number of participants required for this study.

#### 4.4.2 Study development

##### 4.4.2.1 Survey design

The survey was developed by the primary researcher (JB) using Microsoft forms. Following discussion with in-country researchers from Universidad de CES and Fundación Arrieros Colombia this platform was selected to increase ease of use. Due to lack of internet connectivity within some communities, the survey was completed on paper and manually uploaded following completion of data collection. A study introduction and consent page, which all participants were required to complete, were included at the beginning of the survey. The survey was comprised of 37 questions split across three main sections [Appendix VII]:

- Participant demographics
- Knowledge and perception of colic
- Current management practices

Question development was supported by previous research into colic in working equids in Latin America, along with feedback from World Horse Welfare teams on that specific study in Honduras (Wild *et al.*, 2021a).

Due to low levels of literacy amongst participants, survey questions were read out to participants and research team members selected the most



appropriate response or added in 'other'. Most questions had pre-defined answers to aid survey completion by the facilitator.

#### 4.4.3 Data collection

The survey was carried out in Spanish by in-country researchers from Universidad de CES (SH, MC, DO) and Fundación Arrieros Colombia (CJ and SP). Verbal consent with a written record from researchers was required prior to survey completion.

Staff and students from Universidad de CES and Fundación Arrieros Colombia completed surveys in-person as verbal structured questionnaires. Training was given to those involved in data collection by the primary researcher (JB) prior to data collection. For questions 17 (What signs of colic do you know?), 18 (What causes/ risk factors associated with colic do you know?) and 19 (What treatment methods would you use if your equid had colic?), pre-defined answers were not provided to avoid bias. Participant responses were instead recorded by the facilitator as free-text responses. Completed paper-based surveys were manually uploaded onto Microsoft Forms by students from Universidad de CES (MC, DO) During this process all free text answers were translated to English and free-text responses categorised into existing pre-defined answers. Responses which could not be categorised were recorded as 'other'.

#### 4.4.4 Data analysis

Data from the survey was exported from Microsoft Forms into Excel (Microsoft Office 365, Microsoft) to allow for data cleaning and analysis. Descriptive analysis was performed, with parametric data reported using mean values and non-parametric data reported using the median and Interquartile Range (IQR). Frequency percentages were calculated for all categorical data. A summary of additional comments for relevant questions are included in the results to give additional information; however, these answers were not included in any further analysis.

## 4.5 Results

### 4.5.1 Demographics

A total of 58 surveys were completed in September 2022. Ninety percent (n=52/58) of participants were male. The age of participants varied from 18 to 77 years, with a mean age of 44. Twenty-four surveys were completed in Apartado, nine in Andes, eight in Cocorna, six in Kütünsuma and 11 in Machete Pelao [Figure 13]. Some questions were not answered by all participants and therefore the total number of responses is given for each question.

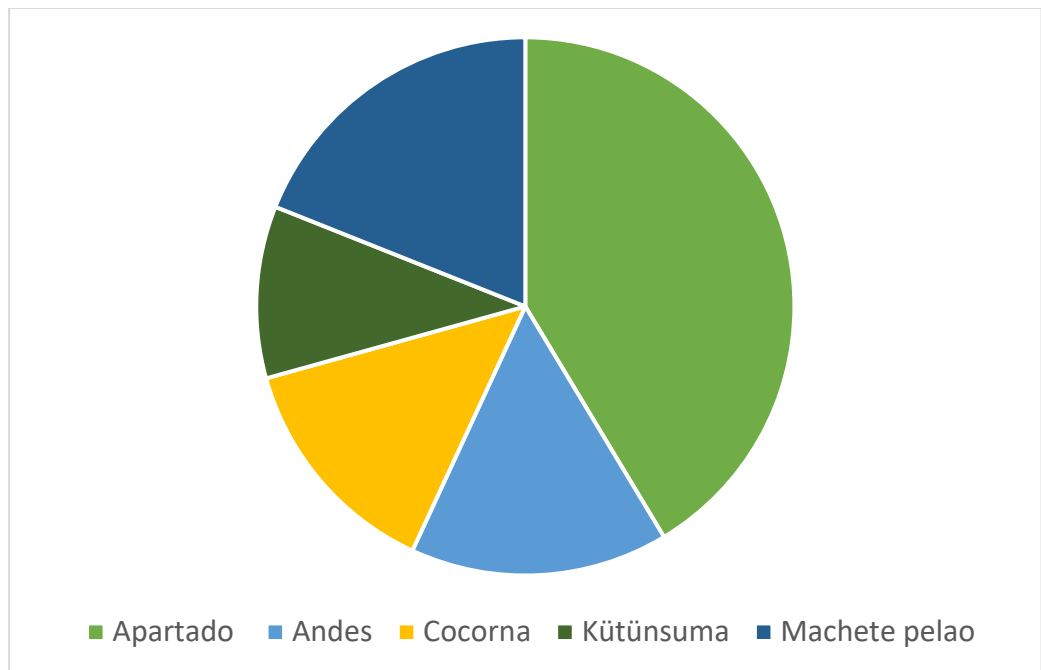


Figure 13: Pie chart showing the proportion of participants (n=58) from each of the five communities in Colombia from a baseline colic survey exploring the current knowledge and perceptions of equine colic, and identifying potential risk factors for the development of colic.

#### 4.5.2 Equid ownership information

Ninety percent (n=52/58) of participants owned an equid (or had one within their immediate family), 5% (n=3/58) rented equids for work and 14% (n=8/58) were involved in the care of someone else's equid(s). Years of experience with equids varied, with most participants having between 11 and 20 years (32%, n=16/50) or 20 to 40 years' experience (32%, n=16/50).

Most equids were either male horses (45%, n=26/58) or female mules (36%, n=21/58). Donkeys were owned the least frequently with 3% (n=2/58) of participants owning one or more male donkeys; and 2% (1/58) owning one or more female donkeys [Table 5].

Table 5: Table showing the number of each type of equid owned by participants in a survey of working equid owners' knowledge and understanding of colic in Colombia.

NUMBER OF EQUIDS OWNED	HORSES		MULES		DONKEYS	
	Males	Females	Males	Females	Males	Females
<b>1</b>	15	8	7	3	1	0
<b>2-3</b>	10	6	10	12	1	1
<b>4-6</b>	1	1	2	2	0	0
<b>7-10</b>	0	0	0	4	0	0
<b>TOTAL</b>	26	15	19	21	2	1

Equids were used for a variety of work types. This included 60% (n=35/58) of participants using their equid(s) for material transport, 48% (n=28/58) for crop transport, 40% (n=23/58) for family transport, and 33% (n=19/58) for people transport (not family)[Figure 14].

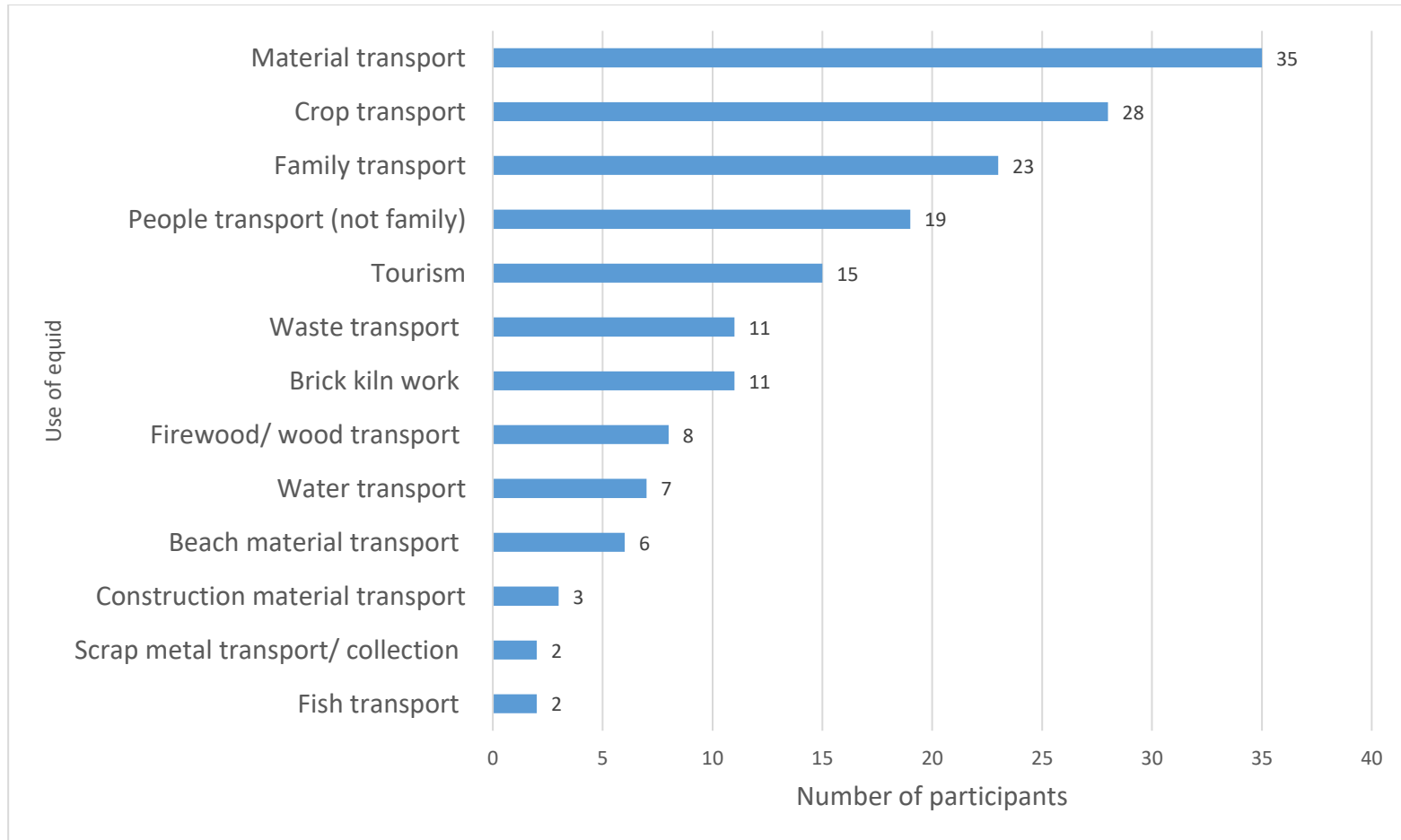


Figure 14: Figure showing the use of working equids across five communities in Colombia in a survey of working equid owners' (n=58) knowledge and understanding of colic.

#### 4.5.3 Working equids and colic

Forty percent (n=23/58) of owners had experienced one or more episodes of colic with their equid(s) within the 12 months prior to this survey. Eight owners (14%) had experienced more than one episode of colic overall, with one participant experiencing a total of five episodes of colic within the past year.

When asked about colic survival rates, eight participants stated that they had never experienced an equid with colic before. Of those who had experienced an equid with colic, 6% (n=3/50) stated the equid(s) had not survived, 16% (n=8/50) stated they rarely survived, 56% (n=28/50) stated they sometimes survived and 22% (n=11/50) stated the equid(s) always survived. Of the 42 owners who had experienced an equid die as a result of equine colic 40% (n=17/42) of participants experienced an equid die before or without treatment, 36% (n=15/42) experienced an equid die during or after treatment and 24% (n=10/42) did not know what happened but were aware that the equids died.

A total of 33% (n=19/58) of participants stated that there was a time of year when colic was more common, 55% (n=32/58) stated that there was not a time of year when colic was more common and 12% (n=7/58) did not know. Of those that indicated that colic was seasonal, ten participants stated that colic was more common in the summer and two felt colic was more common in the winter.

When asked how painful they considered colic to be, with 0 being not painful at all, and 5 being very painful, participants gave a mean rating of 4.6, with 72% (n=42/58) considering this condition to be very painful (rating of 5). Concern about colic was generally high with participants giving an average rating of 4.2 on a scale of 0 (no concern/worried) to 5 (very concerned / worried). However, confidence dealing with a colic emergency varied with participants giving an average rating of 3.5 on a scale of 0 (not confident) to 5 (very confident).

Participants reported a variety of signs of colic that they knew [Figure 15]. The most frequent sign of colic reported by owners was rolling (76% n=44/58), followed by walking/ circling (60% n=35/48), lying down (47% n=27/58) and pawing at the ground (33% n=19/58).

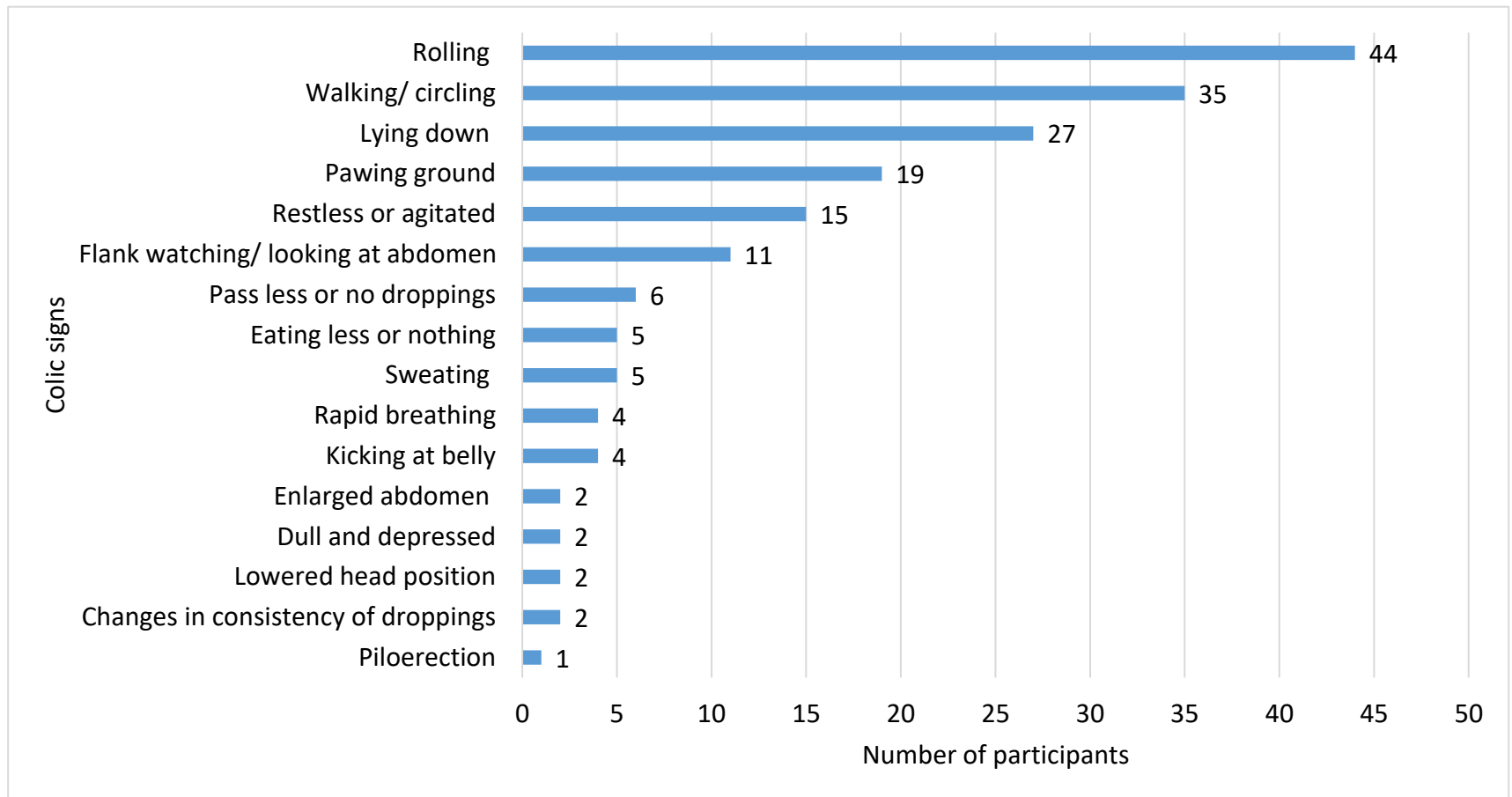


Figure 15: Graph showing the frequency of reported signs of equine colic in five communities in Colombia in a survey of working equid owners' (n=58) knowledge and understanding of colic.

Owners identified a variety of colic risk factors with the most common being ingestion of contaminated feed (53% n=31/58) and feeding inappropriate food (52% n=30/58). A total of seven participants (12%) did not know any risk factors or causes of colic in equids [Figure 16].



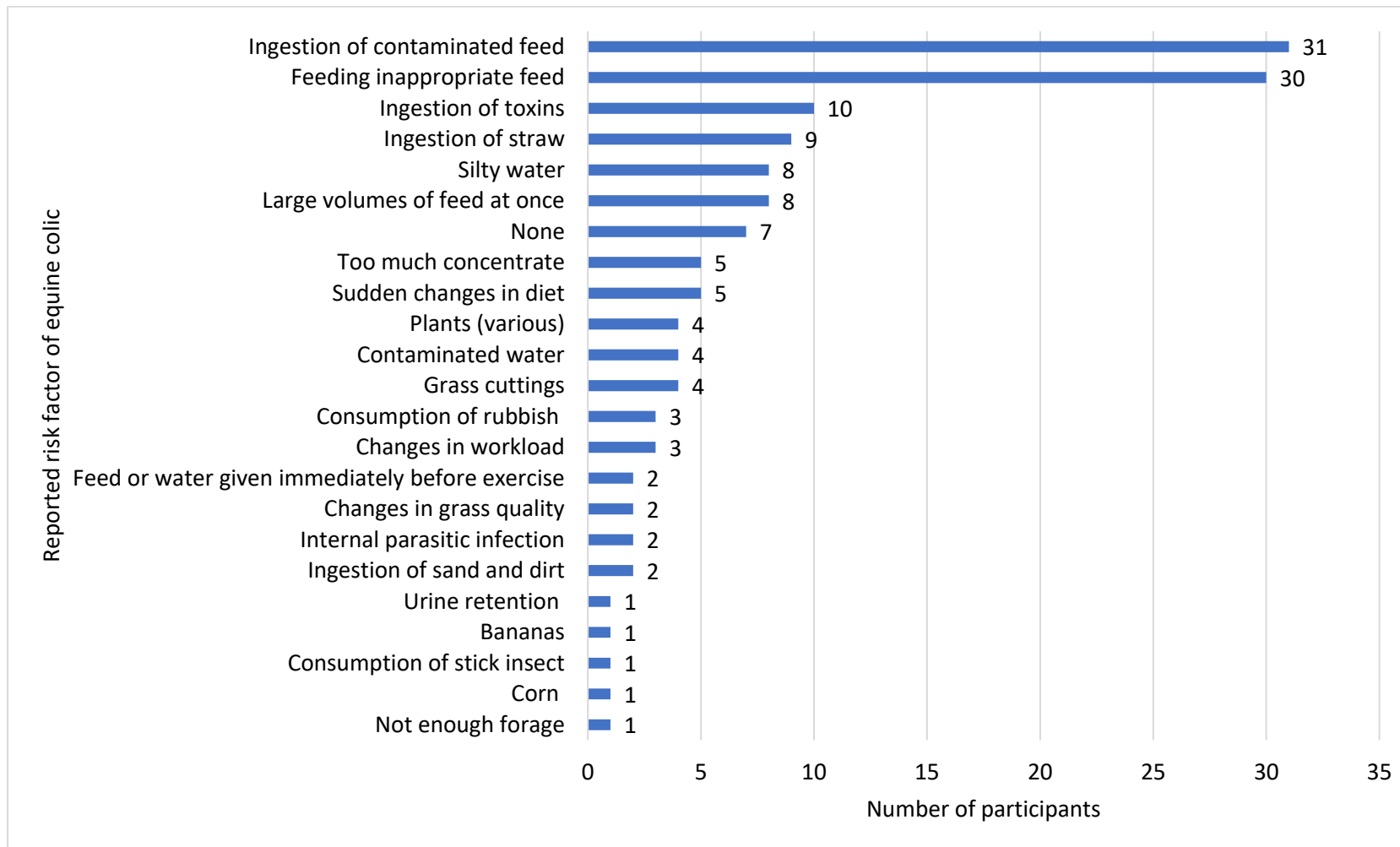


Figure 16: Reported causes and risk factors associated with equine colic in working equids across five communities in Colombia in a survey of working equid owners' (n=58) knowledge and understanding of colic.

The most common treatment method used in cases of colic was beer (64% n=37). Other treatment methods included the administration of avocado (19% n=11/58), urine (14% n=8/58) and cooking oil (14% n=8/58). Four participants reported that there were no treatment methods they would use in cases of colic. Other treatment methods reported included soda, Colivet (dipyrone), paracetamol and coffee. Participants also explained that they would hit the abdomen with a wet sac to treat colic. There was a range of plants used to treat colic that were suggested by owners including matarratas (*Gliricidia sepium*), achicoria (*Cichorium intybus*), totumo (*Creencia cujete*), jengibre (*Aserum canadense*) and contragavilana (*Neurolaena lobata*)[Figure 17].

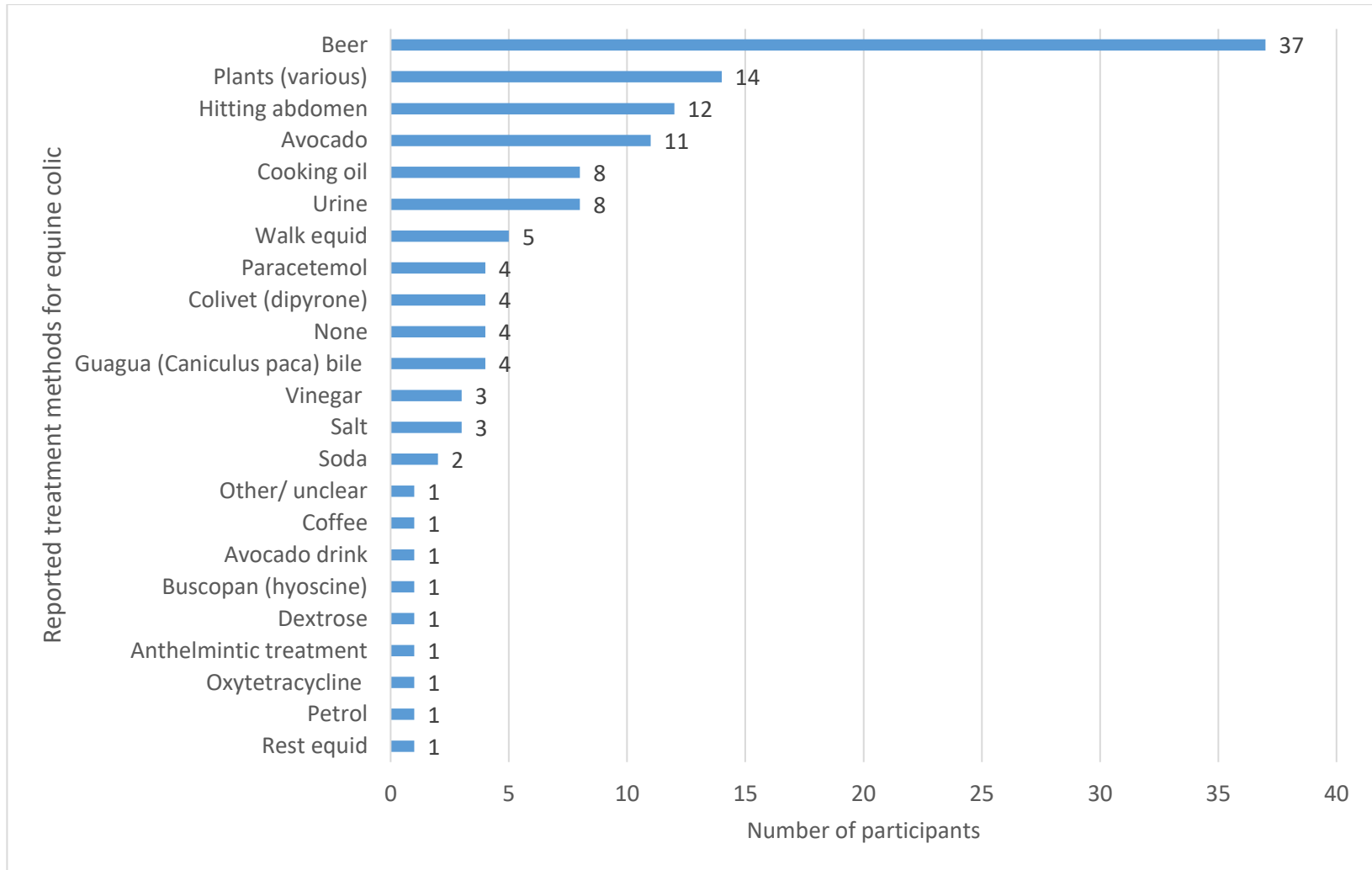


Figure 17: Bar graph showing the treatment methods used for equine colic by working equid owners across five regions of Colombia in a survey of working equid owners' (n=58) knowledge and understanding of colic.

#### 4.5.4 Daily management of working equids

Participants reported that equids were able to graze for a median of 12 hours (IQR 6.5-20 hours) per day.

Ninety-five percent (n=55/58) of participants fed their equids other feedstuffs in addition to grazing. Of those who fed their equids additional feed, 86% (n=48/56) fed molasses, 57% (n=32/56) fed grain, 54% (n=30/56) fed wheat bran, 14% (n=8/56) fed corn, 9% (n=5/56) fed banana or plantain and 4% (n=2/56) fed carrots. A total of 20% (n=11/56) gave their equids other feed but did not specify what. Seventy-six percent (n=44/58) of participants never changed the type of feed their equid(s) was given.

Sixty percent (n=35/58) of participants provided additional feedstuff 1-2 times a day, 24% (n=14/58) of participants fed their equid(s) less than once a day, and 3% (n=2/58) reported not giving their equid(s) any feed in addition to grazing.

Sixty percent (n=35/58) of participants reported that water was freely available to their equids both during and outside of work; 2% (n=1/58) of participants reported that water was freely accessible to their equids outside of work. Twelve percent (n=7/58) offered their equids water 2-5 times a day, 16% (n=9/58) of participants offered their equids water 1-2 times a day, 3% (n=2/58) offered their equids water less than once a day and 7% (n=4/58) never offered their equid water. One participant who stated they never offered their equid water commented that they only give their equid molasses.

Fourteen participants (24%) fed their equid(s) immediately before work, 17% (n=10/58) feed their equids less than 10 minutes before work, 16% (n=9/58) fed 10-30 minutes before work, 16% (n=9/58) fed 30-60 minutes before work and 22% (n=13/58) over one hour before work.

Thirty-four percent (n=20/58) of participants fed their equid(s) immediately after work, 17% (n=10/58) feed their equids less than ten minutes after work,

22% (n=11/58) fed 10-30 minutes after work, 9% (n=5/58) fed 30-60 minutes after work and 14% (n=8/58) over one hour after work.

Sixty-four percent (n=37/58) of participants offered their equids water immediately after work, 10% (n=6/58) offered water within ten minutes, 17% (n=10/58) within 10-30 minutes, 5% (n=3/58) within 30-60 minutes and 3% (n=2/58) offering their equid(s) water over an hour after working.

Overall, 43% (n=25/58) of participants felt that it was likely that their equids had access to rubbish and other non-food items that they may consume.

The workload of equids varied with 14% (n=8/58) of participants working their equids 1-2 hours per day, 67% (n=39/58) working their equids for 3-6 hours per day and 19% (n=11/58) for 7-12 hours per day. The number of days each equid worked for varied, with the most common answer being 3 days per week (28% n=16/58). A total of 59% (n=34/58) of participants stated that their equids workload changed throughout the year. The most common reasons for a change in workload were changes in demand (74% n=25/34) and harvest (29% n=10/34). Other reasons included changes in the owner's routine (15% n=5/34) and seasonal changes (9% n=3/34).

Participants were asked about how frequently they administered anthelmintics to their equid, 36% (n=21/58) of owners wormed their equid quarterly, 26% (n=15/58) biannually, 14% (n=8/58) annually, 10% (n=6/58) once a month, 3% (n=2/58) less than once a year, 2% (n=1/58) once a week and 2% (n=1/58) never. Four participants (7% n=4/58) stated that they did not know how frequently their equid(s) were wormed. Participants were then asked how frequently their equid(s) had their teeth checked. A total of 69% (n=40/58) never had their equid's teeth checked.

Outside of work, 53% (n=31/58) of participants kept their equid(s) in a field with some kind of fencing, 31% (n=18/58) kept their equid(s) in a stable, 26% (n=15/58) were left loose/ roaming, 7% (n=4/58) were kept in a shed and 2% (n=1/58) were kept tethered/ tied up. Two participants selected 'other', which included one participant keeping their equid in a house.

## 4.6 Discussion

### 4.6.1 Study overview

Colic is a common problem seen within equid populations worldwide. With a high mortality rate, the consequences of colic can be severe (Mair and Smith, 2005, Tinker *et al.*, 1997a, Christophersen *et al.*, 2014). Beyond the welfare implications of colic, there are also associated economic impacts seen globally (Traub-Dargatz *et al.*, 2001). Regardless of the increased reliance and financial challenges faced by working equid owners, there is limited research into the potentially intensified effect of equine colic in low- and middle-income countries. This study highlighted the significant frequency and consequences of equine colic within these populations. Forty percent of owners in this study had experienced one or more episodes of colic with their equids within the past 12 months. Seventy-eight percent of participants in this study stated that colic was always, often or sometimes fatal. Seventy-two percent of participants had experienced at least one equid die as a result of equine colic, 40% of which died before or without any treatment.

Risk factors of equine colic are well known, with certain management practices increasing or decreasing the likelihood of an equid developing colic (Archer and Proudman, 2006, Curtis *et al.*, 2019). Whilst it is likely that these causes of colic are present in other countries such as Colombia, there is currently little evidence supporting this. Throughout this study working equid owners reported that the most common risk factors associated with colic were ingestion of contaminated feed (53%) and feeding inappropriate food (52%). Type and quality of feed are well known risk factors for equine colic globally (Curtis *et al.*, 2019); however, other risk factors reported in this study including consumption of rubbish are more specific to a working equid environment and are not reported in this evidence synthesis, highlighting the lack of current evidence. It is important to consider risk factors such as these when developing methods to reduce colic rates in working equid environments.

Owners in the UK are advised to contact a veterinary professional in cases of colic and have the option of medical or surgical management where appropriate (The British Horse Society, 2022b). Whilst some working equid owners have access to veterinary professionals (Nye *et al.*, 2021), this may not be the case for all working equid owners. Many owners in this study reported using home-remedies to treat colic on their own. The most common treatment for colic across these five communities in Colombia were beer (64%), avocado (19%), urine (14%) and cooking oil (14%). The efficacy and potential detrimental effects of these treatments is unknown.

When considering how to reduce the risk and consequences of equine colic in working equid populations, it is vital to consider the differences in barriers to care and treatment and the current level of knowledge of the owners. With little to no access to veterinary care and the use of potentially dangerous treatment methods, this study highlights the importance of prevention of equine colic within these working equid communities as their only practical tool to reduce the impact of colic.

#### 4.6.2 Limitations

One aim of this study was to identify how significant a problem equine colic was within five working equid owning communities. Many studies investigating colic in developed countries rely on veterinary reports and case notes (Scantlebury *et al.*, 2011, Archer *et al.*, 2008a, Archer *et al.*, 2008b, Curtis *et al.*, 2019). However, access to veterinary care in these communities is extremely challenging and therefore veterinary confirmation of colic cases would not be a reflective measure of the frequency of colic. Instead, this study relied on owner reported cases of colic and suggests that 40% of owners had experienced at least one case of colic with their equid in the past year. However, it is important to consider owner ability to identify colic cases. Owners identified rolling (76%), walking/ circling (60%), lying down (47%) and pawing at the ground (33%) as signs of colic. However, many owners did not identify more subtle signs of colic such as a lowered head position (3%), changes in consistency of droppings (3%) and the equid appearing dull and

depressed (3%). This may suggest that owners are not always able to identify cases of colic and so the true frequency of colic may be even higher than reported in this study. Other studies investigating colic in working equids also relied on owner reports to conclude frequency of colic (Salem *et al.*, 2017). Salem *et al.* also concluded high rates of equine colic; with the prevalence of colic being 55% within a working equid population in Egypt. This supports the high rates of equine colic in working equid populations.

This study also aimed to understand the risk factors associated with equine colic within working equid owning communities. As with colic prevalence, this study relied on owner reported causes of colic and owners reports around daily management of colic. As this study relied on owner perceptions and previous experiences, rather than veterinary diagnosis, it is impossible to conclude the true causes of colic episodes within this study. Whilst it would be beneficial to investigate the true prevalence and causes of colic, this was not possible due to time constraints and the local environment. However, this study does provide important insight and owner beliefs on the high risk of colic and the potential risk factors associated.

Data collection was carried out in person as many working equid owners have low levels of literacy and therefore required support for survey completion. The use of purposive selection also allowed data to be collected from hard-to-reach communities that would otherwise be impossible if using other methods. Ensuring the inclusivity of these individuals improves the support available within these communities and is vital to improve the welfare of working equids and the livelihoods of their owners.

#### 4.6.3 Key findings

##### 4.6.3.1 Frequency and consequences of colic

This study found a high colic rate with 40% of owners having experienced one or more episodes of colic with their equids within the last 12 months. The reported occurrence of equine colic globally varies, with studies suggesting an annual prevalence of 3-19% (Kaneene *et al.*, 1997, Mellor *et al.*, 2001, Hillyer



*et al.*, 2001, Tinker *et al.*, 1997b, Traub-Dargatz *et al.*, 2001). Colic is well known as a significant welfare problem to horses, donkeys and mules across the world. Within the US and UK, colic continues to be one of the biggest problems equids face and one of the most common reasons for veterinary call out (Bowden *et al.*, 2017). Whilst it is difficult to directly compare the frequency of colic seen within working equid populations and companion or sport horse populations, the rate of colic concluded in this study is much higher than expected. High rates of colic in working equid populations have been identified prior to this study, with Salem *et al.* concluding that 55% of owners had experienced at least one episode of colic within a 12-month period (Salem *et al.*, 2017).

In addition to the prevalence of colic, it is important to consider the outcomes of these cases. Seventy-eight percent of participants in this study stated that colic was always, often or sometimes fatal. Seventy-two percent of participants had experienced at least one equid die as a result of equine colic, 40% of which died before or without any treatment. Determining the survival rate of equine colic is challenging and varies depending on a multitude of factors from the signalment, history and underlying cause to treatment option selected and additional complications (Dukti and White, 2009). Studies have estimated a mortality rate between 6% and 20% within various equine populations across the world (Hillyer *et al.*, 2001, Curtis *et al.*, 2015, Bowden *et al.*, 2017, Bowden *et al.*, 2020b). A large amount of research investigating survival rates focuses on referral hospitals, and fatalities are frequently a result of a euthanasia decision. Whilst this is beneficial in higher income countries where complex veterinary intervention is a viable option, it is not appropriate to compare to working equid populations where surgery, hospitalisation or in some cases any veterinary support is not available.

Survival rates of colic in other working equid populations vary. In Honduras, 80% of owners reported that their equids usually survived episodes of colic (Wild *et al.*, 2021a), and in India almost all cases of colic seen at an equine fair were resolved (Mohite, 2014). Interpretation of mortality rates of colic within

working equid communities is challenging, and there is still limited research investigating this. The high mortality rates of colic within these populations may be due to the reliance on owner reports to identify cases of equine colic. If owners are unable to identify more subtle signs of equine colic, it is likely that mild cases of colic will be missed and as a result the reported mortality may appear higher. This also suggests that the reported morbidity rate of colic may be lower than the actual frequency of colic within these populations.

The high morbidity and mortality seen within this study in Colombia highlighted the severity of colic within these specific communities. The high risk, anticipated frequency and guarded outcomes emphasise the need for support and interventions within these communities to improve the welfare of these working animals.

#### 4.6.3.2 Lack of treatment options available

Treatment methods for equine colic in Colombia varied with the most common treatment methods used being beer (64%), avocado (19%), urine (14%) and cooking oil (14%). This study highlighted the use of home-made remedies as treatment methods. This may be due to a number of factors including personal preference, cultural and social norms, and a lack of opportunities to provide alternative treatment options. The lack of veterinary care due to financial constraints and physical access has been seen in these working equid owning communities throughout this thesis. In comparison, in the UK most owners will contact a veterinary professional in some or all cases of colic (Bowden *et al.*, 2020a). Treatment options in the UK include medical management, surgical management and euthanasia with analgesia an important tool to reduce pain and discomfort regardless of the treatment option selected. The lack of treatment options and appropriate pain management in cases of colic is a major welfare concern. Unfortunately, working equid owners such as those in this study often live both rurally and below the poverty line (Burford, 2019). This creates major barriers to

increasing veterinary care and encouraging the use of veterinary support is unlikely to be effective.

Regardless of accessibility to veterinary support, equine owners, including those in the UK have reported waiting to contact a vet or using their own methods to attempt to treat colic (Scantlebury *et al.*, 2014). In the UK the decision to 'wait and see' what happens or use their own forms of treatment was reported in cases where owners perceived the colic episode to be mild. This highlighted that there may be additional considerations in the use of veterinary intervention in cases of colic other than that of physical access to veterinary support. However, as this study was conducted in the UK, the findings may not be reflective of owner decision making in a working equid setting.

Within this study in Colombia, there were a few potential treatment methods identified that may be appropriate within these communities. A small number of owners reported using various medication including Colivet (dipyrrone), Buscopan (hyoscine), oxytetracycline and paracetamol. Anecdotal reports stated that owners can purchase a range of veterinary medications over the counter from Agroveter stores. These stores are often located in larger towns, and in some cases can be extremely difficult to access. However, this does provide potential options for owners in terms of medical management of equine health problems, although also necessitates that they have the skills and equipment to administer them correctly at the correct dose. Equine colic can be managed in multiple ways; in higher-income countries, or with companion and sport horses, some cases will require surgical management (Singer and Smith, 2002). This is not an option for working equids and unfortunately any cases that require surgical intervention will be fatal. However, a large majority of colic episodes can be managed medically (Hillyer *et al.*, 2001). Owners in the US and UK must contact a veterinary professional to medically manage their equid; this will often be done using a mixture of analgesia and anti-spasmodic medications (Jennings *et al.*, 2014, Sanchez and Robertson, 2014, Moore, 2022). Analgesia is incredibly important in reducing

the welfare implications of colic. There is increasing evidence for the use of paracetamol to control pain in horses (Mercer *et al.*, 2023), and whilst the dose required is high, this could be a potential option for working equid owners to manage pain during colic episodes. Buscopan (hyoscine) is also frequently used in the treatment for equine colic (Mair and Edwards, 1998) and could provide owners with another treatment option. Whilst these may provide potential options for treatment of colic, it is unknown how feasible they would actually be. Financial implications are likely to act as a barrier to owner's ability and willingness to purchase medications. Due to the emergency nature of colic, owners may need to purchase medication to keep 'just in case', which many owners may be unable or unwilling to do.

Many of the treatment options reported in this study use home-remedies with no evidence of their efficacy or potential detrimental effects. Beer was the most common treatment methods used by owners in cases of colic, and a small number of owners reported using soda. Whilst there is no evidence to support the use of beer in cases of equine colic, some studies have concluded that the use of carbonated drinks such as cola can be effective in certain situations (Witt *et al.*, 2021). The method of administration of beer and soda was not made clear; however, anecdotal evidence suggests this is either done orally or nasally. As there is lacking evidence around the use of these home-remedies, it is challenging to advise owners on specific methods, and instead focus should be on reducing the dangers associated with various methods e.g. encouraging oral administration of fluids over nasal administration. With implementation of effective treatment methods likely to be challenging, prevention of colic is a more effective route to ensure the improvement of equid welfare.

#### 4.6.3.3 Use of euthanasia in fatal cases of colic

In critical cases based in developed countries, equids may be euthanised prior to diagnosis and treatment, following medical management, or post-surgery (Scantlebury *et al.*, 2014, Christophersen *et al.*, 2014). In many cases of colic, euthanasia provides an ethical option to avoid unnecessary pain and suffering

for cases where successful treatment is not an option (Bishop *et al.*, 2016). The range of treatment options along with the option to euthanise reduce the welfare implications of equine colic in more developed countries such as the UK. However, in low and middle income countries, veterinary intervention is often not an option (Curran *et al.*, 2005). As a result of this, equids are often either treated by owners using home remedies, or left with little to no treatment which in some cases may result in fatalities (Wild *et al.*, 2021a, Nye *et al.*, 2021).

Delayed euthanasia is one of the biggest welfare concerns for equids in developed countries such as the UK (Rioja-Lang *et al.*, 2020, Horseman *et al.*, 2016b, Horseman *et al.*, 2016a) with one study concluding that delayed euthanasia has the potential to cause the greatest amount of suffering to the individual horse (Rioja-Lang *et al.*, 2020). It has been suggested that in the UK delayed euthanasia may be a result of an owner's lack of ability to identify and understand the consequences of clinical symptoms on the welfare of the animal along with financial constraints (Rioja-Lang *et al.*, 2020). Additionally, emotional attachment and social influence have some involvement in decision-making associated with euthanasia (Horseman *et al.*, 2016b). It is likely that all these factors play a role in decision making in low- and middle-income countries such as Colombia; however, due to the environment that working equids exist in, it is likely that additional contributing factors exacerbate the problem. The Brooke's euthanasia guide highlights the importance of euthanasia as an option and discussed appropriate methods of euthanasia (The Brooke, 2023). However, euthanasia is not commonly seen across working equid owning communities. Anecdotal reports suggest that when euthanasia did occur, owners reported shooting or drowning their equids which raise a welfare concern.

Equine colic is a major welfare concern to working equids. Within these five communities across Colombia, the rate of colic is significantly higher than other equid populations. The high morbidity rate within these communities, along with inadequate treatment methods exacerbates the consequences of

colic. With no euthanasia option and limited analgesia the alleviation of suffering is impossible. Targeted interventions to prevent equine colic are required to reduce the extensive welfare implications of colic within these equid populations.

#### 4.6.3.4 Causes of colic- nutrition

The pathophysiology of colic varies, with different affected anatomical regions, degrees of intestinal injury and consequently varying levels of severity and associated pain. Spasmodic colic is one of the most common types of colic (White, 2006). This type of colic is difficult to define and there is a lack of evidence to support the underlying physiology or causes. Tympanic (or gas) colic is a result of a build-up of gas within the intestines (White, 2006). Impactions are a result of the accumulation of foreign material or ingesta in the intestinal system (Blikslager, 2017). This results in the accumulation of fluid, gas and food material oral to the blockage. Strangulating obstructions and volvulus can additionally result in the constriction of the intestinal lumen and blood supply (Blikslager, 2017). This will cause a degree of tissue damage within the gastrointestinal tract which will require surgical treatment (Proudman, 1992, Van Der Linden *et al.*, 2003). Other types of colic can be caused by the accumulation of sand or dirt within the gastrointestinal tract, tumours, dysautonomia, heavy parasite burdens, enteritis, infarction, ruptures, liver disease or pain from other organs located in the abdomen.

In order to prevent colic, it is important to identify the causes and risk factors that equids are being exposed to. The most common risk factors reported by owners within these five communities were ingestion of contaminated feed (53%) and feeding inappropriate food (52%). Nutrition has been identified as a common risk factor associated with equine colic (Cohen and Peloso, 1996, Cohen *et al.*, 1995, Cohen *et al.*, 1999, Scantlebury *et al.*, 2015a, Suthers *et al.*, 2013).

Nutritional practices in working equid communities are largely unknown and are hugely different to those seen in the UK. It is unlikely that owners are able

to provide their equids with nutrient dense, mineral complete concentrate feeds and forage. In the UK, equids are often fed manufactured cereal based mixes (Harris, 1999) which allows owners to evaluate and alter the amount and type of feed depending on the needs of their equid. In comparison, owners in this study fed their equids a mixture of molasses (85%), grain (57%), banana/ plantain (9%) and carrots (4%). Access to feedstuff and clean water is more challenging within working equid owning communities, and many owners will have to rely on limited resources. Insufficient and poor quality feedstuff can lead to a reduce energy intake in equids which can consequently lead to weight loss and disease (The Brooke, 2016).

The nutritional requirements of working equids are also likely to vary massively from companion or sport horses seen in the UK. Working equids are often required to work for long hours, carrying heavy loads (Tesfaye *et al.*, 2010, Van Dijk *et al.*, 2014, Admassu and Shiferaw, 2011). This demanding workload will increase an equid's nutrient requirements.

In addition to the type and quality of feed being intentionally fed to working equids, 43% of participants felt that it was likely that their equids had access to rubbish and other non-food items that they may consume. As mentioned previously, this is an additional risk which affects working equid owning communities. Consumption of non-food items such as rubbish is likely to cause colic within these environments (Bojia *et al.*, 2006). More complex colic such as impactions caused by foreign bodies may require surgery (Boles and Kohn, 1977, Oreff *et al.*, 2020). Without the option of surgery, these cases will be fatal. In these cases, prevention is the only feasible option.

In addition to nutrition, the hydration status of an equid can increase the risk of some types of colic such as impactions (Reeves *et al.*, 1996, Kaya *et al.*, 2009). Due to the warm environment and the high intensity of work required of these equids, hydration is even more important. Despite this, previous studies have found that some working equids are only offered water once a day or once every other day (Kalamanova *et al.*, 2015). This is likely to put them at increased risk of dehydration and impaction colic. Whilst most

owners (60%) in this study reported that water was freely available to their equids during and outside of work, some owners (10%) stated that they offered their equid water less than once per day.

Most aspects of nutrition discussed above have the potential to be modified by owners through small daily changes. This could include changing the type of foods equids are given, and by reducing the access that equids have to non-food items such as rubbish. However, it is important to consider any potential barriers to these changes. The social and physical environment working equids and their owners live in is drastically different to developed countries such as the UK. This highlights the need for research into barriers to change and the feasibility of management changes.

#### 4.6.4 Recommendations for future work

This study highlighted the importance and impact of colic within working equid populations in Colombia. There is an urgent need for measures to help with the prevention and treatment of colic within these communities.

Prevention of colic can be accomplished through simple human behaviour change in terms of equid management practices. Identifying which changes will be feasible requires exploration of the barriers and facilitators that are present within working equid owning communities. Following this, encouragement of behaviour change can occur through targeted interventions with working equid owners. Any support provided to owners and equids must be appropriate and further research is needed to determine the most effective support and delivery methods.



#### 4.7 Conclusion

Equine colic is a significant welfare concern for working equids in Colombia. Owner reported data indicated a high prevalence and mortality rates above those reported in other horse populations. Owners mainly used a number of unproven homemade treatments in cases of equine colic. These factors have a major welfare impact and highlight the importance of colic prevention in the absence of adequate treatment options. Owners reported a strong link between nutrition and colic, with the most common risk factors identified being ingestion of contaminated feed, feeding inappropriate food and consumption of toxic plants and rubbish. Many owners fed their equids, in addition to grazing, with feeds including molasses, grain, wheat bran, corn, banana and plantain and carrots. It was not possible to conclude how the feeding practices may impact colic as the quality and quantity of feed was unknown. However, it is likely that nutrition has some impact on the rates of equine colic within these communities and these factors could potentially be easily modified by owners. Owners reported that many equids had access to non-food items that they may consume, including rubbish bags, which are known to be associated with colic and could be a major contributor to the high rate of colic. Prevention of colic through an appropriate and targeted educational campaign is vital to reduce the welfare and economic consequences of colic within these communities.

## 5 Qualitative study exploring the barriers and facilitators to implementing educational resources around the prevention of equine colic in working equid owning communities across Colombia

### 5.1 Abstract

Human behaviour change interventions are becoming more frequently used within an animal welfare setting. Prior to any intervention development, it is vital have an in-depth understanding of the problem, target population and the social and environmental factors that influence behaviour within the chosen context. Equine colic has been reported by owners as a common problem seen amongst working equids in Colombia. The lack of appropriate evidence-based treatment methods along with the absence of humane euthanasia, intensifies the welfare implications of colic and highlights the vital need for prevention of equine colic within these communities in Colombia.

The aim of this study was to understand the barriers and facilitators to the prevention and management of equine colic within working equid owning communities.

This study used focus groups and participatory workshops and was conducted in two phases. Phase one was carried out in May 2022 and phase two was carried out in September 2022. Theoretical thematic analysis was carried out for both phase one and two of this project. Some codes were defined prior to coding (causes, signs, and treatment of colic, and methods for improving owner knowledge were deductively coded), with further inductive coding carried out to further develop codes and categories throughout including to explore potential barriers and facilitators. Following coding of all transcripts, grouping to form themes and sub-themes was carried out.

Three main themes were identified from the combined analysis of phases one and two: *“The streams dry up in the summer”*: Managing accessibility, resources and tradition, *“Our faithful friend”*: Encouraging desired change, and *“Take a wet toad, stick it to its belly and make the mule trot”*: Current understanding and perceptions of equine colic. The first two themes explore the presence of barriers and facilitators specific to five working equid owning communities. The third provides an insight into current levels of knowledge and identifies existing community misconceptions. This will provide the starting point for information on colic to be built on.

Methods to help improve owner knowledge were discussed throughout the focus groups. Face to face training was identified as the only appropriate methods across all communities.

Development of interventions to support working equids and their owners must consider these external factors that may encourage change, or make change more challenging. By understanding the environment of the communities interventions are aimed at, potential pitfalls can be recognised and methods to overcome these can be identified. The importance of involving working equid owners in research and intervention development has been seen throughout this study. With this involvement is it possible to mould the content and delivery methods of interventions to the communities they aim to support.

#### Contributions to chapter:

Data collection was conducted by staff members and students from Universidad de CES (SH, CG, HD) and Fundación Arrieros Colombia (CJ, SP). Transcription and translation of owner feedback focus groups was carried out by Universidad de CES staff (OG). All other aspects including the development of methods, briefing for data collection, and data analysis were conducted by the primary researcher (JB).

## 5.2 Introduction

Equine colic was reported by owners as a common problem seen amongst working equids in Colombia during Chapter Four of this thesis, and has been reported as a key owner concern in working equid owning communities across other countries (Curran *et al.*, 2005, Wild *et al.*, 2021a, Stringer *et al.*, 2017). The lack of appropriate evidence-based treatment methods, along with the absence of humane euthanasia, intensifies the welfare implications of colic and highlights the vital need for prevention of equine colic within these communities in Colombia.

The vast number of risk factors associated with colic mean there are a number of management practices that can be implemented to reduce the risk of this condition in equids (Curtis *et al.*, 2019). Curtis *et al.* (2019) mainly explored studies conducted in hospital populations and general practice in developed countries; however, a small number of studies were conducted on working equid populations. Therefore, it is likely that many of the risk factors identified will be relevant to working equid populations to a varying degree.

Whilst it is not possible to target all risk factors of colic, there are several steps that can be made by owners on a daily basis that will reduce the overall risk of colic in their equids. Human behaviour change interventions have been used to improve the welfare of animals globally (McDonald and Clements, 2019, Glanville *et al.*, 2020). Behaviour change interventions can be defined as coordinated sets of activities designed to change specified behaviour patterns (Michie *et al.*, 2011). Prior to intervention development, it is vital to have an in depth understanding of the problem and target population, as well as the social and environmental factors that may influence behaviour within the chosen context (Kok *et al.*, 2016). In terms of this thesis, issues associated with equine colic were explored during Chapter Four of this thesis and identified the considerable welfare consequences of equine colic. The next step towards intervention development is to explore the social and

environmental context, and to gain an in-depth understanding of the barriers and facilitators to changing equid management within these communities.

Global NGO teams have identified several challenges associated with working equid owning communities (Haddy *et al.*, 2022). Haddy *et al.* highlighted four challenges associated with engagement within a working equid setting: equid status, physical access to equid owners, a lack of trained equid vets, and challenges with monitoring and evaluation of initiatives. The exclusion of working equids at a policy making level was associated with increased risks of infectious and zoonotic disease due to a lack of vaccination strategies. Access to working equid owning communities also presents a challenge. Those who rely most heavily on working equids often do this because they live remotely. Physical access to these areas is extremely limited, which obviously makes working with these communities difficult (Haddy *et al.*, 2022). There is also a lack of appropriately trained equine professionals across many of the major regions where working equids are important. These challenges impact both the care of the working equids, but also how information is gathered, shared, and adopted within these communities. The remote locations and lack of regular professional support means there is often a lack of knowledge of general care and welfare (Haddy *et al.*, 2022). Identifying barriers such as these is a vital step in intervention development to ensure that any support provided to working equids is appropriate for the context it will be delivered in.

### 5.3 Aims and objectives

The aim of this study was to understand the barriers and facilitators to the prevention and management of equine colic within working equid owning communities.

The study aims were achieved in two phases:

#### Phase 1: Preliminary colic understanding

The objectives for this phase were:

- To gather information about working equid communities in Colombia, including the owner's day-to-day life, the problems they face, and the support available to them, through focus groups in five different communities across Colombia
- To explore the day-to-day care and management of working equids in five communities in Colombia using focus groups
- To ascertain working equid owners' knowledge and approach to equine colic, and identify how knowledge is transferred in five communities in Colombia using focus groups

#### Phase 2: Prioritisation and quantifying colic risks

The objectives for this phase were:

- To further explore colic risk factors in working equid owning communities using focus groups carried out as part of a participatory workshop in five communities across Colombia
- To prioritise the risk factors associated with colic in each community using a group ranking activity
- To explore the aspects of management which are related to the highest ranked risk factors through focus groups
- To identify the most appropriate methods of education delivery within each community through focus groups

## 5.4 Methods

The study was conducted in two phases [Table 6]. Phase one, carried out in May 2022, involved focus groups exploring participants knowledge of colic and management of equids; this phase identified the main owner-reported risk factors associated with colic. The second phase, carried out in September 2022, involved a participatory workshop made up of three focus groups and a ranking activity. This phase required participants to prioritise the colic risk factors identified in phase one and explore how each community would want information or education delivered.

### 5.4.1 Focus group and workshop development

#### Phase 1: Preliminary colic understanding

Verbal consent was required from participants during phase one due to anticipated low levels of literacy. A semi-structured focus group schedule was developed with questions split into three sections [Appendix VIII]:

- Section A: Information on the community
- Section B: Use and care of working equids
- Section C: Knowledge of colic

#### Phase 2: Prioritisation and quantifying colic risks

Written consent was required from participants during phase two following identification of literacy levels during phase one [Appendix IX]. The phase two participatory workshop was split into four sections [Appendix X]:

- Section 1. Focus group on colic risk factors
- Section 2. Interactive activity ranking of risk factors
  - The Brookes ‘Sharing the load: participatory action tools for animal welfare’ was used to design this activity (Van Dijk *et al.*, 2010)
- Section 3. Focus group on day-to-day management of working equids
- Section 4: Focus group on methods of provision of education

Table 6: Table showing an overview of the methods used within a qualitative study investigating equine colic in five communities across Colombia, this table includes information on the data collection time period, methodology, objectives, overview and communities the data was collected in.

	Data collection method	Objectives	Overview	Communities
<b>Phase one</b>				
May 2022	Focus group	<p>To gather information about working equid communities in Colombia, including the owner’s day-to-day life, the problems they face, and the support available to them.</p> <p>To explore the day-to-day care and management of working equids.</p> <p>To ascertain working equid owners’ knowledge and approach to equine colic,</p>	<p>Semi structured focus group with questions split into three sections:</p> <p>A: location, facilities, access to resources, role of community members, and information sharing within community</p> <p>B: equid use, management decisions, stabling and feeding/ diet</p> <p>C: knowledge of recognising signs, strategies for prevention,</p>	<p>Andes, Cocorna, Machete Pelao, Kutunsuma</p> <p>* Unable to visit Apartado due to time constraints and challenges with travel</p>



	Data collection method		Objectives	Overview	Communities
			and identify how knowledge is transferred	and treatment, and consequences of colic	
<b>Phase two</b>					
September 2022	Participatory workshop	Section 1: Focus group on colic risk factors	To further explore the most common risk factors associated with colic within working equid owning communities (nutrition, water, workload, worming- as identified during phase 1)	Participants were asked their opinions of the link between colic and the three key risk factors identified in phase 1 (nutrition and water, worming and workload)	Andes, Cocorna, Apartado, Kutunsüma  * Decision made to exclude Machete Pelao after concluding problems with inter-family and animal abuse.
		Section 2: Interactive activity ranking of risk factors	To prioritise the risk factors associated with colic in each community	Participants were asked to prioritise the three risk factors (nutrition and water, worming and workload) from most to least important	

	<b>Data collection method</b>		<b>Objectives</b>	<b>Overview</b>	<b>Communities</b>
		Section 3: Focus group on day-to-day management of working equids	To explore the aspects of management which are related to the highest ranked risk factors of colic	Participants were asked to discuss the day-to-day management of their equids related to the risk factor they had selected in section two. Questions in this section aimed to identify any barriers change	
		Section 4: Focus group on methods of provision of education	To identify the most appropriate methods of education delivery within each community	Participants were asked to discuss methods of education including their opinions on social media, leaflets and in person trainings	

#### 5.4.2 Sample population

Sample population methods were the same as in Chapter Four.

During phase one it was not possible to visit Apartado due to time constraints and challenges with travel. Therefore, data collection was carried out in the four remaining communities only. During phase two it was decided to no longer continue with this project in Machete Pelao. This decision was made after concluding that there were severe problems with intra-family and animal abuse within this area; and that the community would benefit more from an alternative programme run by Fundación Arrieros Colombia.

#### 5.4.3 Participant recruitment and selection

Participant recruitment and selection methods were the same as in Chapter Four.

Verbal consent was obtained during phase one due to anticipated low levels of literacy amongst participants. Following visit one, the level of literacy within the target communities was better understood and written consent was obtained for phase two with most owners able to sign consent forms after having them read out loud by researchers. In Kütünsuma, it was decided to continue with verbal consent rather than written consent as participants within this community had a much lower level of literacy compared to other communities.

Each focus group required a minimum of three participants to facilitate inter-participant discussion. There was no limit on the maximum number of participants.

#### 5.4.4 Research team and reflexivity

All focus groups were carried out by research staff members from Universidad de CES (SH) and Fundación Arrieros Colombia (CJ and SP). All research team members had received training on conducting focus groups by the primary researcher (JB), and had prior experience of conducting focus groups within these communities. Previous interactions between researchers and participants had been during health brigades or other research studies.

#### 5.4.5 Setting of data collection

The setting of data collection varied; however, all focus groups were conducted in an informal setting within a public space, such as restaurants, classrooms, town halls and in the field.

#### 5.4.6 Data collection

An introduction to the study, the research team and the aims of the study were read to participants at the start of each focus group. Owners were then required to give informed verbal consent and given the opportunity to ask any questions about the project. All focus groups were audio recorded.

#### 5.4.7 Data analysis

##### 5.4.7.1 Transcription and translation

Transcription and translation from Spanish to English was carried out by staff members from Universidad de CES (OG). Transcripts were reviewed by the primary researcher. Any abbreviations or words specific to Colombia were identified and defined. Participants did not review transcripts prior to coding.

##### 5.4.7.2 Coding and theme generation

Data handling and coding was completed using NVivo 12 software. Theoretical thematic analysis (Braun and Clarke, 2006) was carried out for both phase one and two of this project. A mixture of inductive and deductive coding was carried out. Deductive coding was used for coding of the causes, signs, and treatment of equine colic, and the methods for improving owner knowledge. Inductive coding was used for all other aspects of coding. Following coding of all transcripts, grouping to form themes and sub-themes was carried out. Themes from phases one and two were grouped together where appropriate. Analysis from phase one and two was combined during grouping of codes as the findings from each phase overlapped.

## 5.5 Results

Three main themes were identified from the combined analysis of phases one and two:

- *“The streams dry up in the summer”*: Managing accessibility, resources and tradition
- *“Our faithful friend”*: Encouraging desired change
- *“Take a wet toad, stick it to its belly and make the mule trot”*: Current understanding and perceptions of equine colic

The first two themes *“The streams dry up in the summer”*: Managing accessibility, resources and tradition’ and *“Our faithful friend”*: encouraging desired change’ explore the presence of barriers and facilitators specific to five working equid owning communities. The number of factors that decrease the likelihood of intervention success shown throughout the theme *“The streams dry up in the summer”*: Managing accessibility, resources and tradition’ are much greater than the number of factors identified that will increase intervention success seen within the *“Our faithful friend”*: encouraging desired change’ [Figure 18].

The third theme *“Take a wet toad, stick it to its belly and make the mule trot”*: Current understanding and perceptions of equine colic’ provides an insight into current levels of knowledge and identifies existing community misconceptions. This will provide the starting point for future interventions on colic to be built upon.

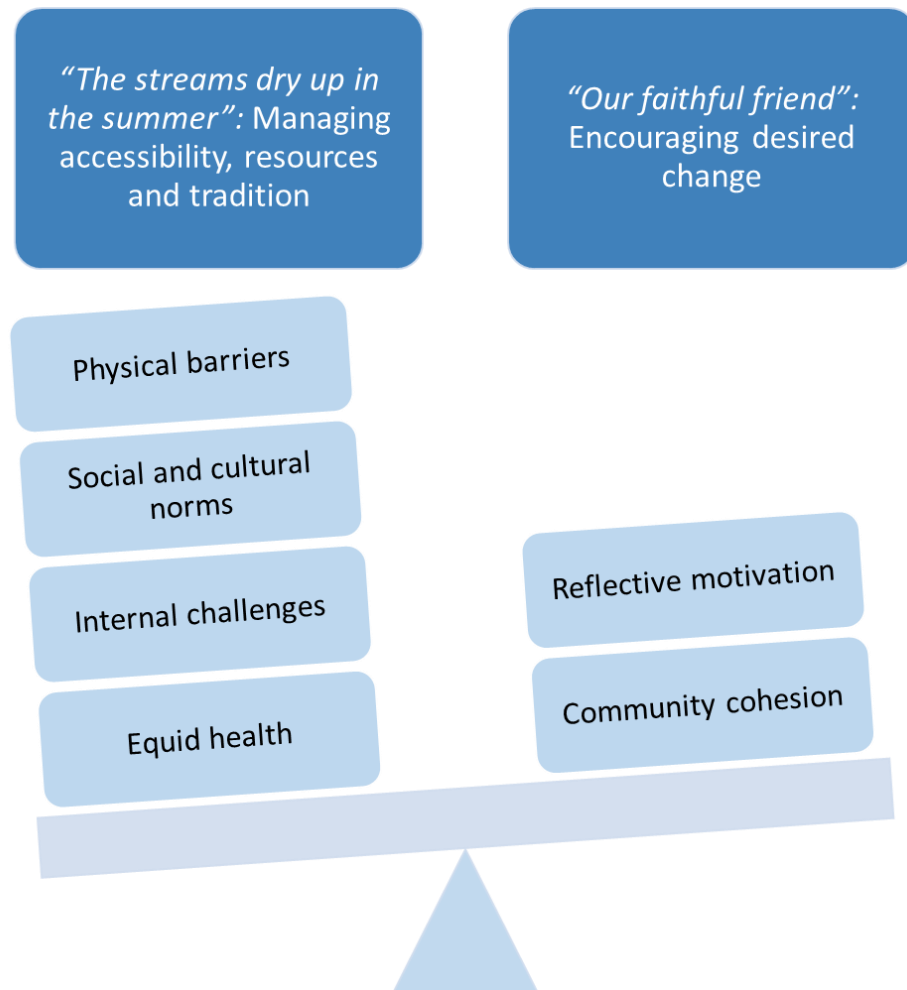


Figure 18: Figure showing the first two themes “The streams dry up in the summer”: Managing accessibility, resources and tradition” and “Our faithful friend”: encouraging desired change” and associated sub-themes identified in a qualitative study exploring the presence of barriers and facilitators specific to the five working equid owning communities in Colombia.

### 5.5.1 “The streams dry up in the summer”: Managing accessibility, resources and tradition

The theme “*The streams dry up in the summer*”: Managing accessibility, resources and tradition’ had four associated sub-themes: ‘Physical environment’, ‘Social and cultural environment’, ‘Internal challenges’, and ‘Equid health’. These sub-themes identified potential challenges that would be faced during attempted behaviour change at individual or community level.

#### 5.5.1.1 Physical barriers

Participants discussed a range of problems that were a result of the physical environment they live in. This included poor quality roads, a lack of sufficient utilities, seasonal variation, financial constraints and limited access to veterinary care.

Poor quality roads were identified by participants in Machete Pelao, Andes and Cocorna. Participants in Cocorna stated that they did not want the addition of more roads, as they felt that caring for the ecosystem was more of a priority.

Participants also highlighted a lack of utilities including electricity, human health care and clean water. Owners from Machete Pelao stated that the water in the community is contaminated, and to access clean drinking water requires travelling around an hour and a half each way. In Kütünsuma, participants reported that during the dry season, there is reduced access to water as the stream dries up.

Participants in Andes stated that the management and workload of equids changed with the season. They described how the coffee harvest season lasts three months (from October- December) during which equids are used to support the harvest; outside of the harvest season, equids are used for mining which requires the equids to work longer hours carrying heavier loads.

Financial concerns were identified throughout focus groups. This was a particular problem in Andes, where owners reported a high cost of living. An

increase in the cost of living was attributed to the Covid-19 pandemic and the war in Ukraine.

*“Not only inputs but also raw material like iron due to the Ukrainian war... and the cost of living for example... the family shopping basket which is impossible to achieve...”- Participant from Andes*

Participants discussed the consequences of a lack of finances, with owners in Kütünsuma stating that it was difficult for individuals to attend further education because of these financial challenges.

Participants from Cocorna, Andes and Kütünsuma reported that they would seek advice from veterinary professionals when needed; however, it was highlighted that this was often problematic. They described issues around location and phone signal, affecting the ability to contact a vet directly. Emergencies were a particular issue due the time delays in contacting a vet and anyone attending.

Participants described how contact with a vet for treatment or a prescription may be complex. Some owners relied on messages being relayed through multiple different people with resulting inaccuracies. For example:

*“In the canyon there are many parts without internet signal... so veterinary care is by means of [working equid owner] telling his neighbour... his neighbour telling another friend until it gets to the “chiva” [public bus] driver... and when the information gets there it is totally different... and the same thing happens... make a remote prescription... I give it to the “chiva” driver... he gives it to someone else... so at times, when the medication gets back...we don’t know what it is...” – Participant from Cocorna*



#### 5.5.1.2 Social and cultural norms

Participants felt that there was a lack of external support, including from the government. Owners from Machete Pelao reported that the communities themselves must fix the roads. It was highlighted that land is often not used efficiently, as a result of a lack of support from the government.

*“It would be nice if the government showed interest because we have a land suitable to plant anything... very good for agriculture... we have to eat what we grow because transportation to take it out is very expensive... we have a lot of fruit trees and the fruit is wasted... it would be good if the government set up a pulper for that fruit.” – Owner from Machete Pealo*

Participants from Cocorna stated that preservation of culture was important.

*“And the most important... to preserve our ancestral assets with modernity... culture... but never ending them.”- Owner from Cocorna*

#### 5.5.1.3 Internal challenges

This sub-theme included reference to general education and literacy level, current knowledge of equid care and management and information transfer. Participants discussed a lack of children’s education across communities. Participants in Machete Pelao stated that very few individuals attend university.

Owners from Cocorna and Kütünsuma discussed a general lack of knowledge around the care and management of working equids.

*“None of us has consolidated what to do when the horse is one year old... two years old... how often I deworm it... it is simply transmitted by word of*

*mouth... sometimes we ask “did you deworm it?” ... “oh yes” ... “oh I didn’t” ...  
ok, deworm it... there is no health plan due to lack of knowledge and  
information...”- Participant from Cocorna*

Participants discussed knowledge transfer, with owners from Andes, Cocorna and Kütünsuma stating that knowledge both of care of working equids and other general knowledge was passed down generations. Owners from Cocorna also stated that knowledge was acquired through experience.

*“Many of us have acquired that knowledge from our ancestors... we have  
always tried to know about plants and what they are good for, and at times  
they also learn to inject...at least the basic things...they also learn in the  
livestock field” – Participant from Kütünsuma*

#### 5.5.1.4 Equid health

This study focused on equine colic, however participants also discussed a range of other equine health problems including lameness, ectoparasites and respiratory disease. These diseases will also impact the welfare of working equids within these communities, and are a concern for owners. Owners from Kütünsuma felt that several health conditions were both more persistent and more severe than seen previously.

*“People used to treat them and cure them with plants, but nowadays, I don’t  
know if diseases are more severe...” – Participant from Kütünsuma*

### 5.5.2 “Our faithful friend”: Encouraging desired change

The second key theme identified was “Our faithful friend”: Encouraging desired change. This theme had two associated sub-themes, reflective motivation and community cohesion, both of which can encourage desired behaviour change.

#### 5.5.2.1 Reflective motivation

Owners in Cocorna discussed a motivation and desire to learn about proper equid care and management. Owners showed an understanding of the issues around lack of knowledge and how important this was to improve the care of their animals.

*“All the community has come to the conclusion that what we need is knowledge... it is the main thing”- Participant from Cocorna*

Participants made it clear that equids are key within the communities. Participants reflected on their impact economically, stating that Andes equids were the only means of work and transport. In both Cocorna and Andes, participants stated that they are only able to eat as a result of the work their equids do.

*“I believe they are man’s best friend...because of them we get food...” – Participant from Cocorna*

Participants made it clear that they valued their equids emotionally with owners from Cocorna referring to them as ‘man’s best friend’ and ‘our faithful friend’.

Owners from Machete Pelao and Kütünsuma stated that it would not be possible to replace an equid if they needed to.

### 5.5.2.2 Community cohesion

Throughout focus groups in Kütünsuma, Cocorna and Machete Pelao, owners reported that individuals within the community often work together to overcome problems. This included supporting each other to improve children's education, road quality and care for equids. In Machete Pelao and Cocorna, participants discussed the presence of organised associations including associations of muleteers in which owners would respect each other and distribute work with tourists amongst themselves.

In Machete Pelao owners also described the importance of working together, stating that there is mutual respect amongst owners, including those living in indigenous communities.

*“Yes, everything here is by association...the guilds are very organised...there is an association of guides, of muleteers, of motorbike taxis...we take turns and respect each other's space” – Participant from Machete Pelao.*

5.5.3 “Take a wet toad, stick it to its belly and make the mule trot”: Current understanding and perceptions of equine colic.

There were five main aspects of colic discussed: definition, causes, signs, treatment and consequences [Figure 19].

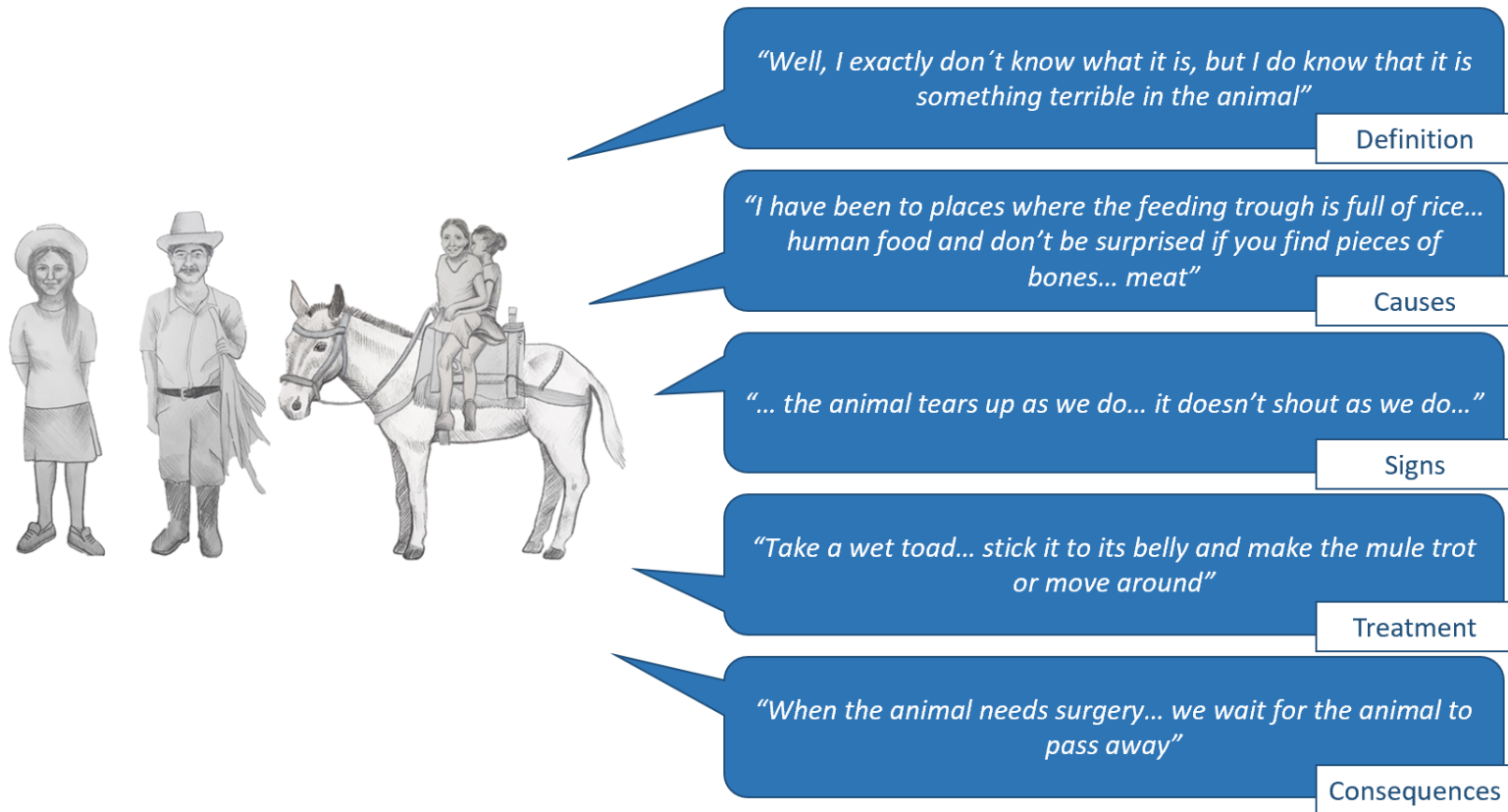


Figure 19: Figure showing the overarching theme "Take a wet toad, stick it to its belly and make the mule trot": Current understanding and perceptions of equine colic' and associated subgroups 'definition', 'causes', 'signs', 'treatment', and 'consequences' identified in a qualitative study exploring the presence of barriers and facilitators specific to Colombian communities.

### 5.5.3.1 Definition of colic

The definition of colic was widely discussed with participants from Andes stating that the term colic referred to abdominal/ intestinal pain. Owners from Machete Pelao, Andes and Cocorna reported that colic was associated with severe pain and that it can be very serious and, in some cases, fatal. Whilst many owners had some understanding of what the term colic referred to many were unable to provide a complete definition:

*“Well, I exactly don’t know what it is, but I do know that it is something terrible in the animal... I would like to know what it is...”- Owner from Andes*

In Andes and Cocorna, participants discussed a type of equine colic known as ‘tambora’ which was associated with severe bloating and extreme pain.

*“It’s like a colic, but they are kind of attacked (desperate)... they don’t urinate or defecate... they bloat up... it’s a very strong pain and they throw themselves to the ground, and first of all, when they are sick... they don’t eat... they are bloated...” Owner from Andes*

### 5.5.3.2 Causes of colic

Three causes of colic were frequently mentioned: nutrition and water, worming and workload.

#### Worming

Internal parasites were reported as a cause of colic in both Cocorna and Machete Pelao during phase one. During phase two thematic analysis identified two associated sub themes: ‘direct cause of colic’, and ‘indirect cause of colic’. Participants reported that the presence of parasite infections and the treatment of parasite infections both directly caused colic.

*“But I have seen when they get parasites and you purge them... more come out, that gives them colic.”- Owner from Andes*

Other owners also discussed how equids with internal parasite infections are more likely to be malnourished and consequently are at more risk of colic. Owners from Apartado also reported that equids with parasite infections are more likely to consume rubbish and as a result are at a higher risk of colic.

*“Of course, if the animal has parasites, it won't get enough food and can be malnourished and get colic...”- Owner from Apartado*

### Workload

During phase two, there were three sub-categories identified for workload: time, load and force. There were a variety of opinions about the impact of workload: some owners felt there was no relationship between workload and colic, whereas others stated that workload could contribute to an increased risk of colic in a variety of ways. Owners from Cocorna stated that an animal could work long hours and carry heavy loads if it was allowed to do so at its own pace; these owners from Cocorna felt that the risk of colic was only increased if the animal was forced to work. Overloading of equids was often attributed to an increased risk of colic, with some owners further quantifying this by discussing the differences in the appropriate load weights and the overall condition of the animal.

*“If the animal works at its own pace... no..., but if you force it and it becomes very agitated, that may cause colic... it is able to work long periods of time, but without being forced...”- Owner from Cocorna*

### Nutrition and water

Participants discussed a range of nutrition related risk factors for equine colic. Nutrition and water was highlighted as the biggest risk factor associated with colic across all communities. Some participants stated that colic was related to an equids diet but did not expand on this any further.

There were a total of four associated categories identified within nutrition and water: content, quality, quantity and routine.

The content of the diet that working equids consumed was reported as a potential risk for colic. Feeding of an inappropriate diet including human food leftovers such as vegetables, rice, meat and bones was highlighted in Apartado and Kütünsuma.

*“I have been to places where the feeding trough is full of rice... human food and don't be surprised if you find pieces of bones... meat...”- Owner from Apartado*

Owners also discussed the potential risk associated with equids consuming rubbish and toxic plants.

*“It is a plant that... it is not a tree... it grows about one meter... it is also given to cattle and it is characterized because it gives them colic...” Owner from Kütünsuma*

The quality of the food given to equids was also commented on throughout focus groups. Participants across focus groups stated that food is often left in the sun to warm up, causing it to become rotten and increase the risk of



equine colic. The general quality of food purchased and used to feed equids was also mentioned as a possible contributing factor towards equine colic. Owners from Kütünsuma identified the quality of water as a potential cause for colic.

The quantity of food given to equids was also highlighted as a risk factor for colic. Owners stated that when equids are underfed and malnourished they are at a higher risk of colic. Owners from Cocorna also discussed how feeding large quantities of concentrate feed can also lead to colic.

*“Perhaps... grain, concentrate... if you feed them in excess... it depends on the amount...”- Owner from Cocorna*

Owners from Cocorna referenced a lack of water as a cause of colic.

An equid’s routine included the times equids were fed each day, and was discussed in Apartado and Cocorna. Owners from these two communities suggested that feeding immediately before or after work, or suddenly changing an equid’s feeding routine would increase the risk of colic.

#### 5.5.3.3 Signs of colic

Owners reported a range of signs of equine colic. These included a lack of urination and defecation, reduced appetite, bloating, agitation, flank watching and tearing up/ crying. Agitation, bloat and reduced defecation were the more commonly reported signs. When discussing agitation as a sign of colic, owners referred to rolling, lying down, circling, running, spinning and becoming desperate.

*“Generally, a mule starts to wallow, walks around and runs like crazy... that is the main thing...”- Owner from Machete Pelao.*

*“... the animal tears up as we do... it doesn’t shout as we do...”- Owner from  
Cocorna*

#### 5.5.3.4 Treatment of colic

Reported treatment methods used for colic included engine oil, avocado, beer, guagua (*Cuniculus paca*) bile, onion and milk, specific plants, urine, wood ash and strapping a toad to the horse’s abdomen. Some methods required nasal or oral administration. Participants reported that these home-remedies were effective in treating colic. Owners from Machete Pelao reported that they would try whatever they had available to them.

*“Take a wet toad... stick it to its belly and make the mule trot or move  
around”- Owner from Machete Pelao*

*“Some people use human urine... injected...intramuscular”- owner from  
Kütünsuma*

#### 5.5.3.5 Consequences of colic

The consequences of equine colic varied; however, it was clear that colic was a major concern for equid welfare and owner livelihood with even the most simple colic cases detrimental to the equid’s working ability and therefore owner income generation. The duration and severity of colic cases was reflective of the emotional and economic impact on their owners. Owners from Andes highlighted that even in the best-case scenario, an equid would be unable to work for three days, and reported that if treatment was not given, colic episodes could last a couple of weeks.

*“It depends on the treatment you give the horse, because there are different kinds of colics... there are some that pass quickly and there are others which don’t... if you detect the illness right away... the animal can be well next day and working in three days... but if you wait today, tomorrow and the next day... the animal is worse... you see that after eight or fifteen days the animal is sicker... I mean, it depends on the spirit you put into it.”- Owner from Andes*

Owners described that in some cases colic would last for days, and equids frequently died.

*“When the animal needs surgery... we wait for the animal to pass away...” –  
Owner from Cocorna*

When equids die of colic, their owners must acquire replacements to continue working, however, owners from Machete Pelao and Kütünsuma explained that it is very difficult and expensive to buy a new equid.

#### 5.5.4 Methods for improving owner knowledge

Methods to help improve owner knowledge were discussed throughout the focus groups. Face to face training was identified as the only appropriate methods across all communities. The use of booklets and WhatsApp was also highlighted as appropriate in Cocorna. However, participants in Kütünsuma stated that using WhatsApp would not be appropriate within their community due to problems with signal. In Apartado, the use of flyers was identified as inappropriate, as people would not actually look at/ read them.

## 5.6 Discussion

### 5.6.1 Overview of findings

This study explored the experiences and opinions around colic in working equids, in the context of the social and geographical environment these equid populations are living in, to inform the development of targeted, appropriate educational interventions for different communities. A range of potential barriers were identified, including finances, education and knowledge level, equid health, access to veterinary care, physical environment and lack of external support. These barriers must be taken into account when considering how behaviour change could reduce the risk of equine colic. Factors to encourage desired behaviour change included reflective motivation and community cohesion.

Knowledge of the definition, signs, causes, treatments, and consequences of colic varied between owners, and supported the need for owner education. Owners described the main risk factors associated with colic within their communities as worming, workload, and nutrition and water. Nutrition and water were selected as the most significant risk factor across all communities and were associated with four associated categories: content, quality, quantity and routine.

When asked about methods of delivering education, all the communities agreed that a face-to-face method was most appropriate. Other methods, such as flyers and the use of WhatsApp were appropriate in some communities to support face-to-face trainings but would not be effective in other communities.

### 5.6.2 Limitations

Purposive sampling was used to ensure that a range of communities was investigated. Andes, Cocorna and Machete Pelao were more representative of working equid owning communities across Colombia and had reported problems with equine colic. Apartado was selected for two reasons. This area has a history of severe conflict (Burnyeat, 2018), with anecdotal reports

highlighting that as a result of this, women in this region ended up taking on additional responsibilities with working equids. Women in Apartado continue to have a significant role in the care and management of working equids. Inclusion of Apartado was important to ensure the involvement of women in working equid research and intervention development. Women play an important role in the lives of working equids across the world (Abbas, 2014, Ali *et al.*, 2014); however, many women feel they lack access to equid specific knowledge and skills training (Valette, 2014a). The second important factor in deciding to include Apartado is the involvement of this community in the replacement of working equids. The local government is currently carrying out a replacement scheme in which many working equids will be replaced with motorised vehicles. This will have a dramatic impact on the role equids play within this community. Kütünsuma was included as this is an indigenous community; here the management of human and animal health relies largely on ancestral knowledge and traditional medicine. An increase in the use of working equids within indigenous communities has been seen within some regions in Latin America, with many of these communities now heavily relying on working equids for transportation purposes (Rogers *et al.*, 2023).

By including a range of communities, it allowed the study to explore a greater range of barriers and facilitators and will ensure intervention development will be more inclusive. Purposive sampling is often used within qualitative studies to select participants most appropriate and useful for the aims of the study (Campbell *et al.*, 2020). This sampling method is often used to gain different and important perceptions from individuals that would otherwise be missed (Troost, 1986, Robinson, 2014). Given the aims and objectives of this study, purposive sampling of communities was selected as the most appropriate method of sampling, to ensure consideration of a range of communities. Whilst it would not have been possible to use purposive selection of individual participants, selecting specific communities to work with ensured a range of individuals were likely to participate.

Findings from this study are only generalisable to the communities that the data was collected in. This study concluded that the barriers and facilitators to behaviour change vary depending on the community, and therefore interventions need to be developed to specifically fit the target populations. As a result of this finding, the generalisability of the data is less relevant as regardless it is vital to ensure each working equid community is considered prior to intervention development and delivery.

### 5.6.3 Key findings

#### 5.6.3.1 Identifying barriers and managing community specific challenges

Developing interventions to be implemented in low- and middle-income countries such as Colombia has additional challenges. Many behaviour change and intervention development models lack focus on resource constraints at an individual level (Evans *et al.*, 2022). Reduced opportunities are a major consideration within low- and middle-income households and countries, and could have a dramatic impact on intervention success. There are a number of models that have been used to develop interventions to be used in low- and middle-income countries, with many focusing on three central concepts: opportunity, ability and motivation (Evans *et al.*, 2022). These concepts are reflected in the COM-B model that states that for any behaviour to occur an individual must have the appropriate capabilities, opportunities and motivation (Michie *et al.*, 2011). Many of the barriers identified in this study result in a lack of opportunities for individuals and prevent certain behaviours from occurring. The COM-B model has been used as framework for identifying barriers and facilitators, and developing interventions across a range of human health settings in both high and low- and middle-income countries (McDonagh *et al.*, 2018, Boyd *et al.*, 2020, Barker *et al.*, 2016, Birkás *et al.*, 2021, Cummings *et al.*, 2017). This model highlights the influence of external influence and barriers on an individual's behaviour. Haddy *et al.* (2023a) conducted 32 semi-structured interviews with NGO staff working across 8 animal welfare NGOs working across 13 countries. Participants reported the use of behaviour change models including the COM-B model to identify

underlying causes of poor welfare and to identify appropriate methods of support. Whilst the COM-B model has reportedly been used within a working equid settings, there is a lack of published literature to support this. Within this study the decision was made to take the COM-B model into consideration, without using the model directly during analysis, this was to increase the inductive nature of the coding used. This avoiding confining the data to pre-existing frameworks and ensured that the analysis was reflective of the context in which it was collected.

The importance of identifying barriers and facilitators when designing interventions has been seen across human health settings, with the involvement of various stakeholders used to tailor programmes to be more suitable to the situation they will be implemented in (Majid *et al.*, 2018, Flottorp *et al.*, 2013, Field *et al.*, 2014). Interventions with prior understanding of barriers are more likely to be successful (Baker *et al.*, 2015). As discussed in Chapter Three, working equids and their owners often live in challenging environments and the influence of external factors is often exacerbated. This means that they become critical considerations for the development of education for owners.

If the greatest barrier to a specific behaviour is a lack of physical opportunities, then it would be meaningless to develop an intervention to educate and persuade individuals to engage in that behaviour as they are intrinsically unable to pursue them. External factors, including financial implications and access to veterinary care were identified as a major barrier in this study. When providing guidance for owners on preventing and managing colic, both are major challenges. With no access to veterinary care, treatment options for working equids are extremely limited. Guidance around colic is often based around encouraging veterinary support (The British Horse Society, 2022b) with early recognition and intervention increasing outcome success (Proudman *et al.*, 2002). This advice is not appropriate for working equid owners due to the difficulties accessing veterinary treatment. Prioritising the prevention of equine colic and reducing the use of potentially

harmful treatment methods are far more appropriate methods within these communities.

This study identified significant aspects of the environment that will impact the education provided, including factors affecting nutrition and management. It is well known that dehydration and consumption of poor quality water can have negative impacts on an equids health (Kaya *et al.*, 2009, Reeves *et al.*, 1996); however, across low and middle income countries including Colombia, there are still many individuals without access to clean water (UNOPS, Queiroz *et al.*, 2020), and so increasing the access equids have to clean water would not be a possible solution. Working equid owners from Kütünsuma and Machete Pelao discussed challenges with accessing clean water, but this was not mentioned by owners from Andes or Cocorna. This highlighted how barriers differ between communities and locations and demonstrates a need for interventions to be developed to fit each specific community. Any interventions need to focus on aspects of equid care that are possible to change for the individual owners that it is targeted at.

#### 5.6.3.2 Encouraging desired behaviour change

When looking at human behaviour models and frameworks such as the COM-B model of behaviour change, motivation makes up an important aspect needed for a behaviour to occur (Michie *et al.*, 2011). Motivation is a complex component and can be influenced by a large range of internal and external factors including impulses, inhibition, wants, needs, beliefs, values and expectations (West and Michie, 2020). Wants and needs are often found in the centre of motivation as seen in PRIME theory and can be important drivers of behaviour change (West and Michie, 2020, West and Michie, 2019). PRIME theory combines a number of frameworks and theories associated with motivation to form one single model. PRIME theory includes components such as impulses, inhibitions, motives (wants and needs), evaluations (involving beliefs, memory, sensory processes, and values), and plans (West and Michie, 2020).



Owners from Cocorna and Machete Pelao expressed a desire to learn which will be an important contributing factor for behaviour change. A motivation to learn more about the care of working equids and the prevention, identification and management of equid colic shows intention to work towards behaviour change; however, this does not necessarily mean that behaviour change will be achieved. Desires are highlighted as an important contributor to motivation in the COM-B model, where motivation is composed of automatic and reflective aspects (Michie *et al.*, 2011).

In addition to the impulses and desires seen in automatic motivation, reflective motivation is also key in this model. Reflective motivation highlights that understanding the outcome and consequences of an action play an important role in the motivation to carry out a specific behaviour (West and Michie, 2020). Understanding how a certain behaviour can result in a desired outcome can help to provide motivation to carry out that behaviour. Throughout this study, working equid owners made it clear that they understood the importance of their equids. Equids were vital to the daily support of owners, and they described how their equids were unable to work when they had colic. This demonstrates the consequences of colic reaching beyond the welfare of the equids into the community itself. This is a powerful motivator for owners to change their behaviour to reduce the risk of colic. However, in order to do so they must actually have the appropriate knowledge, skills and opportunities.

Owners attending health brigades, and therefore participating in this research study, are likely to be motivated to provide appropriate care for their equids. However, there are still a huge number of owners who are less motivated and therefore harder to engage with through provision of equid health care and owner education. Individuals less inclined to participate in interventions to improve behaviours are often those most in need of change, for example, within a human health setting those who are unmotivated to participate in health promoting behaviours are often most at risk of associated health problems (Hardcastle *et al.*, 2015).

The transtheoretical model of behaviour (TTM) describes six stages of change in which individuals must progress along (Prochaska and Velicer, 1997)[Figure 20]. This model was initially designed to explain addictive behaviours and is more frequently being used within health care settings. The stages of this model are precontemplation, contemplation, preparation, action, maintenance and termination. When in the precontemplation stage, individuals have no intention to carry out a specific behaviour; individuals may be unaware that a change is needed, or may believe the cons of changing a behaviour outweigh the pros. During the contemplation stage, individuals now intend to change their behaviour within the near future; however, they are unaware of how to do so. In the preparation stage individuals will be taking small steps towards the desired behaviour change. Following the preparation stage, individuals will move into the action stage where they have recently changed their behaviour and intend to continue to do so. The next stage is the maintenance stage, during which individuals will have sustained their behaviour change for more than six months. Individuals intend to continue to do so. The final stage is the termination stage in which individuals have no desire to revert back to their old behaviour. Individuals may move between stages at any point.

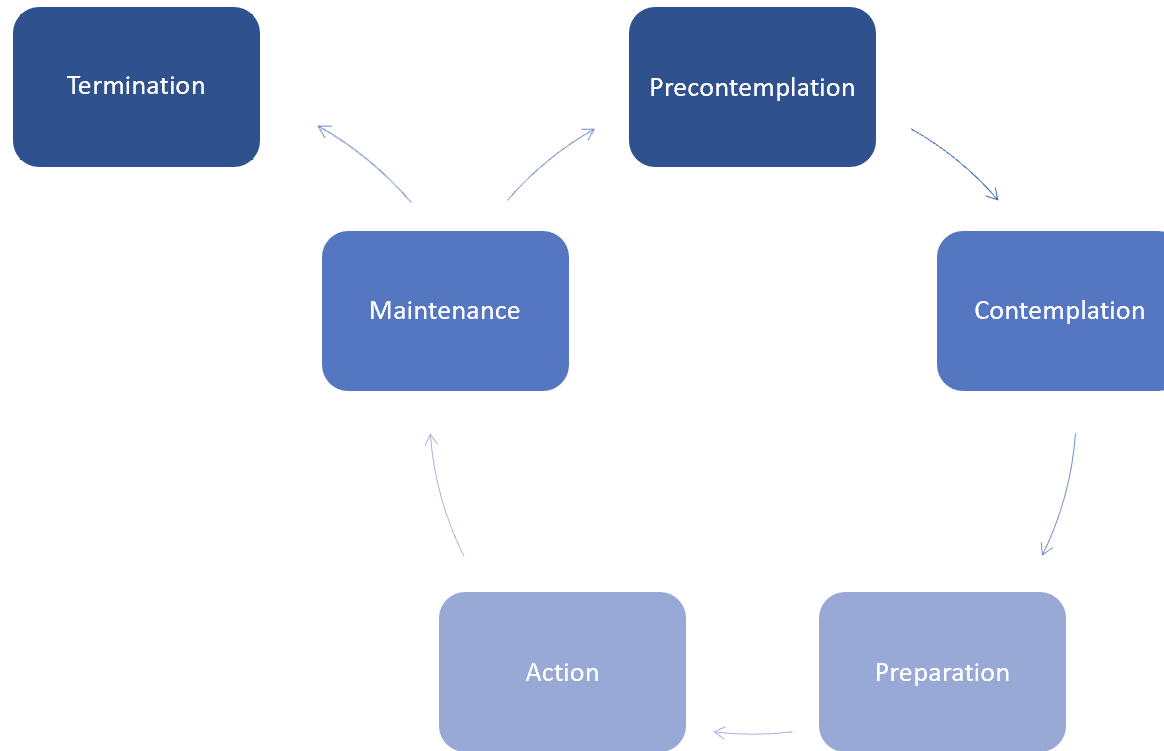


Figure 20: Transtheoretical model of behaviour change showing the six stages of human behaviour change (Prochaska and Velicer, 1997).

The transtheoretical model of behaviour describes these unmotivated individuals as being in the precontemplation stage, where they may be unaware of the changes that need to occur, or strongly believe that the consequences of change outweigh the benefits (Prochaska and Velicer, 1997). Targeting unmotivated individuals can be challenging regardless, and within a working equid setting even contacting these owners would be extremely difficult.

One method of spreading information to individuals within a community who may be less motivated to attend formal interventions is through the social transmission of knowledge. Community learning involves peer-to-peer transmission of information, and provides a route for knowledge to be spread throughout a target community (Rodas and Pérez, 2014). Cohesion within a community has been linked with increased motivation to invest time and energy into sharing knowledge with others (Reagans and McEvily, 2003, Haddy *et al.*, 2021a). Community cohesion was identified as a sub-theme demonstrating that there was social support present throughout working equid owning communities. This community cohesion provides an opportunity for social transmission of knowledge and can act as a vital route to those individuals who are less motivated to actively engage in interventions, and/ or provide their equids with appropriate care. This social support provides encouragement and help to individuals within the community and can help encourage behaviour change (Springer *et al.*, 2006, Greaney *et al.*, 2018). This has been seen in studies encouraging increased exercise in adults (Christensen *et al.*, 2006). The development of social support and relationship development with other participants increased the likelihood of adults continuing to attend exercise classes. Considerations to encourage the development of social support included the number of individuals in the class, similarities in interests and attributes between participants, and the use of group activities. This could be hugely beneficial to encouraging behaviour change and should be integrated into any future educational campaigns.

### 5.6.3.3 Risk factors associated with equine colic

Equine colic is a common health problem seen in equids worldwide (Bowden *et al.*, 2020b, Tinker *et al.*, 1997a, Ireland *et al.*, 2011). This study relied on owner reported causes of equine colic. However, many causes and risk factors reported by owners within this study are reflective of the causes of colic identified through epidemiological studies in pleasure and sport horses (Tinker *et al.*, 1997b, Kaya *et al.*, 2009, Reeves *et al.*, 1996, Cohen *et al.*, 1999), and therefore are likely to be significant within working equid populations.

Many colic causes are gastrointestinal and as a result this is often the main focus in relation to colic across the world (Curtis *et al.*, 2015). This was also seen throughout this study with most owners exclusively discussing gastrointestinal related colic cases. Owners in this study identified three main risk factors for equine colic; nutrition and water, worming, and workload. All of these factors are management based and could be reduced through changes in owner behaviour.

There is evidence associating endoparasite infection and anthelmintic treatments with an increased risk of equine colic from studies of other horse populations (Snalune, 2008, Reinemeyer and Nielsen, 2009, Cohen *et al.*, 1999, Kaneene *et al.*, 1997, Scantlebury *et al.*, 2015a, Back *et al.*, 2013). Parasites are often controlled by regular worming practices, along with pasture management such as rotational grazing, mixed-species grazing and regular removal of droppings (Snalune, 2008). Housing of working equids can make management practices such as these more challenging; some equids will be kept in small stabled areas which remove the possibility of grazing management (Norris *et al.*, 2020, Rodrigues *et al.*, 2020). Regular removal of droppings should be carried out by owners, and regardless of what housing equids are kept in, this is largely feasible. However, some studies have reported equids being left in dirty, soiled stables for long periods of time (Norris *et al.*, 2020).

The accessibility to and cost of anthelmintics makes endoparasite control feasible in developed countries such as UK. However, due to the barriers discussed in this study, financial constraints and challenges associated with access to veterinary care and treatments make parasite control more difficult in working equid populations. Whilst results from Chapters Two and Four of this thesis described some use of wormers in working equid owning communities, this was often infrequent and unregulated. There is existing research showing high parasite loads in working equids (Singh *et al.*, 2012, Valdéz-Cruz *et al.*, 2013), and there is no reason to believe that they are less susceptible to colic caused by parasites than the other equid populations where this has been studied. Research focusing on colic in working equids has also highlighted problems associated with endoparasites (Salem *et al.*, 2017). Although the evidence level from this current study is low (self-reported by owners, without clinical data or incidence data to quantify it), this study suggests that endoparasites may be an important risk factor for equine colic in working equid populations and warrants further investigation.

Throughout this study, participants also discussed the role that workload plays in colic risk. Again, although the evidence level from this study is low, this is consistent with work in other horse populations. Higher workloads and increased exercise, specific disciplines and changes to exercise routines have all been attributed to an increased risk of colic in pleasure horse populations (Kaneene *et al.*, 1997, Hillyer *et al.*, 2002, Cohen *et al.*, 1999). These factors will also occur in working equid populations and may be more extreme than those seen in pleasure horse populations. Working equids frequently work long hours, carrying heavy loads over long distances, and overworking has been highlighted as a problem within these populations (Admassu and Shiferaw, 2011, Van Dijk *et al.*, 2014). Working equids also experience significant changes in workload over the year, most commonly around harvest and mining seasons (Valette, 2015). The intense and changing workload are both likely to increase the risk of working equids developing colic. Owners throughout this study reported that overworking an equid was a cause of

colic within these communities; this is consistent with data from other horse populations, and therefore should be an important consideration for colic prevention.

Nutrition was identified as a major risk factor for equine colic, with participants identifying this as their single most important risk factor.

Research has identified a huge number of nutritional factors associated with an increased risk of equine colic (Curtis *et al.*, 2019), including quantity and quality of concentrate feed given (Tinker *et al.*, 1997b, Hassanpour *et al.*, 2007), specific food types (Tinker *et al.*, 1997b, Cohen and Peloso, 1996, Reeves *et al.*, 1996, Hudson *et al.*, 2001), changes in diet (Tinker *et al.*, 1997b, Cohen *et al.*, 1999, Cohen *et al.*, 1995, Hudson *et al.*, 2001, Hassanpour *et al.*, 2007) and forage type given. Whilst most of this research only considers companion and sport horses in developed countries, these are likely to affect equids globally due to the physiological processes involved in colic. However, the frequency at which working equids are exposed to these causes and risk factors of colic is likely to be different. Alongside nutrition, water plays a key role in gastrointestinal function with a lack of water resulting in dehydration increasing the risk of colic (Reeves *et al.*, 1996, Kaya *et al.*, 2009, Kaneene *et al.*, 1997). Working equids are particularly at risk due to the warm environments they often live in, often limited water access, and heavy workloads (Wild *et al.*, 2021a).

There have been a small number of studies investigating colic in working equid populations specifically; however, there is still a lack of research in this area. The epidemiological causes of colic within these communities are largely unknown; however, one study based in India concluded that impaction colic was seen most commonly, and was believed to be associated with the use of low digestible coarse feed and dehydration (Mohite, 2014). Other studies focusing on working equids have concluded associations between colic and specific feed types (Salem *et al.*, 2017); and the consumption of foreign materials such as rubbish (Mirazo *et al.*, 2012).

While the results from this study relied on owner reported causes and risk factors for colic, these results were consistent with epidemiological studies conducted in other equid populations. This supports the findings from the study. However, to fully determine the most frequent causes of colic in working equid populations, an epidemiological case control or cohort study would be required.

#### 5.6.4 Recommendations for future work

This study explored barriers and facilitators present within working equid owning communities in Colombia, and identified the common risk factors for equine colic. There are a number of external factors including road quality, financial implications and a lack of resources that will impact the opportunities available to working equid owners. Many of these factors are extremely difficult or impossible to change. These factors must be considered during intervention development and implementation. Without understanding the complex environment of the target populations, intervention success is limited. This thesis focuses on reducing the risk of equine colic through owner behaviour change. In order to develop a successful intervention, the findings from this chapter must be considered. For example, a lack of water can lead to the development of colic. This risk can be reduced by increasing the volume of water that equids are offered within a day; however, as identified within this study, not all communities have access to large quantities of clean water and therefore this change will not be possible. If an intervention was developed around increasing water uptake, and was then implemented in a community where water is lacking, then this intervention will be unsuccessful.

This highlights the vital need to develop an in depth understanding of the problem identified, target population, and the social and physical environment prior to the development of an intervention. The potential barriers and facilitators in each community vary and as a result, interventions must be flexible in their approach and desired outcomes.



Following the distribution of interventions, evaluation of the efficacy of the intervention is needed. Studies should continue to work alongside participants to ensure support is appropriate. Monitoring outcomes and collecting feedback will ensure any further barriers are identified; which will allow the opportunity to overcome these challenges and check the success of support.

## 5.7 Conclusions

This study provided further insight into the social and physical environments of working equid owning communities across Colombia, and helps to pinpoint potential barriers and facilitators to behaviour change. Development of interventions to support working equids and their owners must consider these external factors that may encourage change, or make change more challenging. By understanding the environment of the communities which interventions are aimed at, potential pitfalls can be recognised and methods to overcome these can be identified. Additionally, this study has increased the understanding of the causes, knowledge, treatment and consequences of colic in working equids. This is essential to identify aspects of change that will have the most impact to reduce colic and improve working equid welfare and owner livelihoods. The importance of involving working equid owners in research and intervention development has been seen throughout this study. With this involvement is it possible to mould the content and delivery methods of interventions to the communities they aim to support.

## 6 Development of an education-based intervention aimed to reduce the risk of equine colic in working equids in Colombia

### 6.1 Abstract

An interactive educational intervention encouraging prevention and management of equine colic in working equid populations was delivered in four communities in Colombia in February 2023. This intervention covered the definition, signs, causes and treatment of equine colic. The link between colic and nutrition and water management was discussed and participants identified one to two small changes they could make to prevent colic. The intervention involved interactive activities and simple discussions supported by a leaflet. It was vital to evaluate this intervention to investigate outcomes and to identify if objectives of the intervention were being met.

Following the development and implementation of an educational intervention, this study aimed to evaluate an educational intervention delivered in four communities in Colombia through identification of changes in knowledge and owner reported changes in behaviour and management practices. This was a mixed methods study involving a longitudinal survey on knowledge of colic and feedback focus groups. The survey was conducted immediately before, immediately after and three months after the intervention. Owner focus groups were carried out three months after delivery of the intervention. Descriptive analysis was carried out on survey data. Deductive coding was used for analysis of focus groups.

There was an overall increase in the knowledge of the signs and causes of equine colic both immediately and three months after the intervention. Prior to the educational intervention, owners reported a median number of 3.5 colic signs. Immediately after the interventions owners reported a median of 5.5 signs, and three months after the intervention owners reported a median

of 5 signs. The median number of causes of colic identified before the intervention was 3.5. This increased to 4.5 immediately after, and 4 three months after the intervention.

Analysis of the owner feedback focus groups identified three overarching themes: 'Awareness and understanding of education content', 'Intention and development of ideas for change', and 'Evidence of and action towards behaviour change'. 'Awareness and understanding of education content' highlighted owners ability to remember what was taught during the intervention three months prior. Some owners were able to further expand on the content by giving further details on the reasoning behind why certain management practices would result in colic. The second theme of 'Intention and development of ideas for change' showed participants identifying and discussing the changes that needed to occur and explaining how this could be done. 'Evidence of and action towards behaviour change' was the final theme, with owners from all communities reporting some evidence of change to the management of working equids as a result of what had been taught in the intervention. Examples of change included improvement in the management of rubbish, removal of fermented feed, moving feed and water out of the sun, and encouraging gentle walking of equids with colic.

Feedback on the guide was collected from researchers involved in the delivery of the educational intervention. Positive feedback included appropriate content, engaging delivery, and evidence of impact. Challenges that were reported throughout the questionnaires included the owner not understanding aspects of the education, difficulties with changing perceptions and behaviour, a lack of participation, and participant fatigue as a result of the two rounds of the survey.

There was evidence that the education intervention was successful at improving owner knowledge of equine colic. It was also clear that there had been small changes in the right direction that could help to prevent cases of colic occurring within these working equid populations. It is important to

continue to working with working equid owners from these communities in order to encourage further behaviour change.

Contributions to chapter:

Data collection was conducted by staff members and students from Universidad de CES (SH, CG, HD) and Fundación Arrieros Colombia (CJ, SP). Transcription and translation of owner feedback focus groups was carried out by Universidad de CES staff (OG). All other aspects including the development of methods, briefing for data collection, and data analysis were conducted by the primary researcher (JB).

## 6.2 Introduction

Intervention development frameworks such as intervention mapping (Fernandez *et al.*, 2019) and the behaviour change wheel (Michie *et al.*, 2011) can be used when designing, implementing and evaluating interventions for participant education. These frameworks can help to increase the efficacy of interventions by providing methods to encourage human behaviour change (Michie *et al.*, 2011, Fernandez *et al.*, 2019). Previously, research and literature on these intervention frameworks has been focused within human health care settings, but there has been increasing interest in the use of human behaviour change and intervention frameworks to improve animal welfare (White and Rogers, 2017, Glanville *et al.*, 2020, Carroll *et al.*, 2021).

Current intervention approaches used by NGO's to support working equids and their owners vary depending on the size, structure and aims of the organisation (Upjohn *et al.*, 2014). Interventions may be in the form of educational programmes for children (Aguirre and Orihuela, 2010), participatory methods (Whay *et al.*, 2015), advocacy, free veterinary treatment (Curran *et al.*, 2005, Crane *et al.*, 2011, Galindo *et al.*, 2018) and skills training such as farriery and saddlery (Mohite *et al.*, 2019, Attwood *et al.*, 2010). Whilst many organisations have previously used the provision of free veterinary treatment; there has been an increase in the use of other interventions such as education and advocacy (Haddy *et al.*, 2022).

There is limited available research investigating the outcomes and impacts of these interventions (Upjohn *et al.*, 2014). Implementing interventions with little to no knowledge of their effectiveness risks failing to meet participant expectations, future participant disengagement, as well as wasting valuable time, money and resources (Glasgow *et al.*, 1999). Haddy *et al.* (2022) explored the perceptions and outcomes of intervention types. This highlighted the benefits and drawbacks of interventions frequently used within working equid NGO's and took into consideration the feasibility, outcomes and resources requirements of each intervention.

One study exploring long-term initiatives in Mexico highlighted high rates of knowledge transfer within the community and suggested that combined approaches enhance the success of welfare interventions (Haddy *et al.*, 2021a). Stringer *et al.* concluded that owner knowledge of donkey care could be improved most significantly using diagrammatic hand-outs and in-person meetings (Stringer *et al.*, 2018). This study also assessed the use of an audio programme and whilst this did improve owner knowledge, this was less effective than other methods.

The need for intervention evaluation within a working equid setting has been well recognised (Upjohn *et al.*, 2014). Evaluating interventions not only benefits those implementing the intervention but provides the opportunity for others to learn what works and what does not.

### 6.3 Aims and objectives

The aim of this study was to design and evaluate a targeted educational based intervention for working equid owners to reduce the risk and impact of equine colic.

The objectives for this study were:

- To use findings from previous studies in this thesis, along with existing literature to develop an informed intervention to facilitate behaviour changes within each community
- To produce an easy to follow, repeatable facilitator guide to allow the educational intervention to be easily delivered by in-country teams
- To assess changes in the number of correct signs and causes of equine colic identified by working equid owners using a longitudinal survey carried out immediately before, immediately after and three months after intervention delivery
- To co-develop the educational curriculum through gaining feedback from working equid owners on the process, content and effectiveness of the intervention through focus groups with owners in four participating communities
- To gain feedback from research staff on the ease of delivery and effectiveness of the intervention through a questionnaire

This chapter is split into two phases. Phase one involved the development of the educational intervention, and phase two involved the evaluation of the educational intervention [Figure 21].



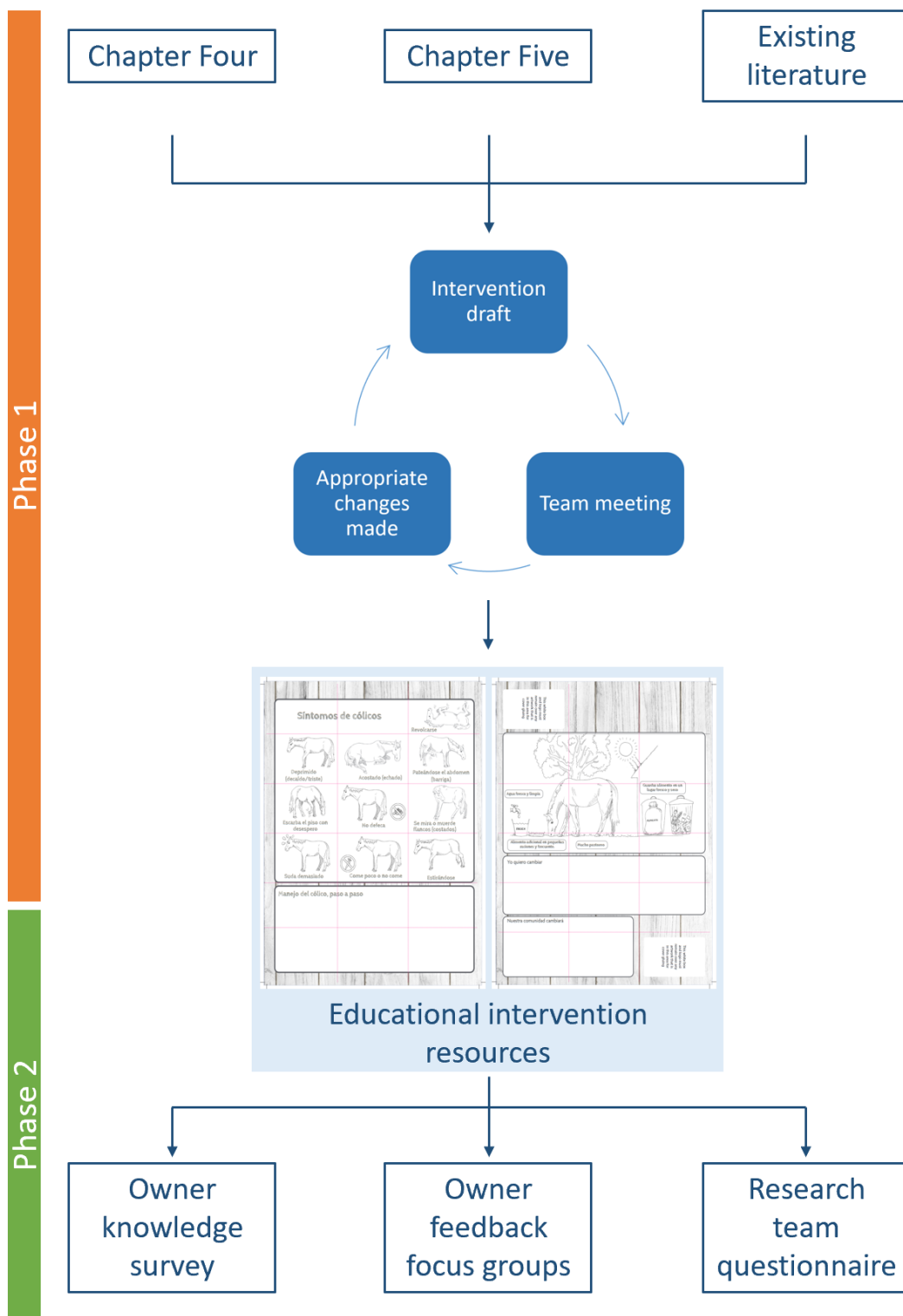


Figure 21: Figure showing the two phases in the development and evaluation of an intervention aimed to reduce the risk of colic in working equid populations in Colombia.

## 6.4 Phase one: Development of educational intervention

### 6.4.1 Phase one methods

An educational intervention was co-created through an iterative design process between October 2022 and January 2023. Intervention mapping (Fernandez *et al.*, 2019) was used to guide the development process.

Multiple draft versions of the intervention were created by the primary researcher (JB), and weekly meetings were held with staff members from Nottingham University (JB, KB, JHB, SF), World Horse Welfare (IW), Universidad de CES (SH) and Fundación Arrieros Colombia (CJ, SP) to discuss progress and feedback on the educational intervention throughout the development process.

#### 6.4.1.1 Contributions from previous chapters

Findings from Chapter Four and Five of this thesis contributed to the content and delivery methods used within the intervention developed in this study [Table 7].

Following the analysis of Chapter Four, colic was identified as a major concern within each community. The high frequency and mortality along with a lack of treatment options resulted in the decision to focus on the prevention of equine colic. By reducing the frequency at which colic occurred it would consequently reduce the associated fatalities and reduce the use of potential harmful treatment methods.

Chapter Five ranked nutrition as the most significant risk factor for colic within working equid populations in these communities. There were a number of nutritional related risk factors identified by participants, including exposure to rubbish, consumption of contaminated feed, and limited access to water, and a number of potential barriers were identified. Considering these two findings, the intervention developed would need to be flexible and

allow owners to develop their own ideas for change that they felt were feasible with regards to the specific external environment they were living in. This led to the decision to include the objective development section of the intervention.

Chapter Five also identified that owners had a varied literacy level. In order to ensure inclusivity of owners, it was important to use diagrams and simple words instead of longer sentences. The intervention aimed to be sufficiently understood without needing any reading or writing skills.

Table 7: Table showing the key findings from previous chapters in this thesis that contributed to the development of an intervention aimed at reducing equid colic in working equid owning populations.

THESES CHAPTER	FINDINGS	CONTRIBUTION TO INTERVENTION
<b>CHAPTER FOUR: BASELINE COLIC SURVEY</b>	40% of owners had experienced one or more episodes of colic within 12 months prior to the study, 6% of owners stated equids never survived	Supported the need for intervention aimed to reduce colic in working equids within these communities in Colombia
	Most frequently reported signs of equine colic were rolling, walking/ circling, lying down and pawing at the ground	Importance of including more 'subtle' signs of colic such as appearing depressed, kicking at abdomen and flank watching
	Most common risk factors associated with colic were ingestion of contaminated feed and feeding inappropriate food	Focus of prevention was on basic nutrition. Provision of owners with multiple options for prevention methods depending on current management practices
	Most common treatment methods used for colic was beer, avocado, urine and cooking oil	Highlighted the need for information regarding safe and effective methods for treating equine colic

THESES CHAPTER	FINDINGS	CONTRIBUTION TO INTERVENTION
<p><b>CHAPTER FIVE: IDENTIFICATION OF BARRIERS AND FACILITATORS</b></p>	<p>Overarching theme ‘Managing accessibility, resources and tradition’ highlighted a number of factors that may act as barriers to owner behaviour and management changes</p> <p>Presence of physical barriers such as poor quality roads, a lack of access to veterinary care and financial constraints</p> <p>Internal challenges included general education and literacy level, current knowledge of equid care and management</p>	<p>Showed a need for recommended owner behaviour and management changes to be flexible as some prevention methods for colic may not be feasible due to external factors</p> <p>Recommendations for prevention and treatment of equid colic cannot rely on veterinary support, or be expensive</p> <p>Intervention must be appropriate for those with low levels of literacy. Highlighted the need for diagrams and images rather than large amounts of written information</p>

THESIS CHAPTER	FINDINGS	CONTRIBUTION TO INTERVENTION
	<p>Owners identified a range of health problems such as lameness, ectoparasites and respiratory disease that were a problem within their equid populations</p>	<p>Identified the preference for the intervention to be easily modified in the future to target other health problems</p>
	<p>The overarching theme ‘Encouraging desired change’ had two associated sub-themes: reflective motivation and community cohesion.</p>	<p>These indicated areas that could facilitate desired owner behaviour and management changes.</p>
	<p>Reflective motivation highlighted the importance of working equids and the owners the importance of improving their knowledge.</p>	<p>Highlighting the importance of proper equid care to ensure equids were able to work would provide owners with motivation.</p>
	<p>Community cohesion illustrated the support within the community.</p>	<p>Community cohesion was used to develop group activities and encourage change as a community</p>
	<p>The current level of knowledge of equine colic amongst owners highlighted a number of areas for improvement.</p>	<p>Supported the need for education around equine colic.</p>

<b>THESIS CHAPTER</b>	<b>FINDINGS</b>	<b>CONTRIBUTION TO INTERVENTION</b>
	A lack of knowledge of the definition, signs, causes and treatment methods for equine colic were identified.	Established an understanding of what was already known and what areas need more improvement

#### 6.4.1.2 Development of intervention

The educational intervention aimed to provide working equid owners with a basic level of knowledge of the causes, signs, treatment and prevention of equine colic, and encourage owners to alter their management practices to reduce the risk of equine colic occurring. Table 8 shows each section of the intervention, an overview of the content within each section, and the source of evidence to support the information included.



Table 8: Table showing an overview of content, reason for inclusion and supporting evidence for each section included in an educational intervention aiming to provide working equid owners with basic knowledge of equine colic, and develop objectives to encourage management changes to reduce the risk of colic.

	Overview of content	Reason for inclusion	Source of evidence
<b>Education workshop content</b>			
Introduction to equine colic	Short introduction to equine colic (5-10 minutes) given to owners, covering what is meant by the term colic, why it is important to prevent and identify colic and the link between nutrition and colic.	To introduce all owners to the topic and ensure everyone has a basic understanding of what colic is and what will be covered in the education activities.	Definition and causes of equine colic (The British Horse Society, 2022b, Curtis <i>et al.</i> , 2019, Hackett, 2013)
Colic signs activity	Interactive activity requiring owners to discuss diagrams showing ten common signs of equine colic (rolling, lying down, kicking at abdomen, pawing at ground, no droppings, flank watching, sweating, eating less or	To encourage owners to identify signs colic, including those that may appear more subtle such as stretching or appearing dull and depressed. To discuss whether each sign indicates colic, whether some signs suggest more severe colic, and any differences that	Presenting signs of colic in equids (The British Horse Society, 2022b, The Donkey Sanctuary, 2020a, Southwood and Fehr, 2012)

	<b>Overview of content</b>	<b>Reason for inclusion</b>	<b>Source of evidence</b>
	nothing, stretching and appearing dull and depressed).	might be seen between donkeys, mules and horses.	
Nutrition activity	Interactive activity during which owners were required to write or draw aspects of nutrition on post-it notes and stick these on a 'happy' or 'sad' equid poster depending on whether they thought it increased/ decreased the risk of equine colic.	To explore owners' current knowledge of equine nutrition and colic and to overcome any misunderstandings. To encourage owners to share current knowledge with each. To provide owners with additional knowledge that may be missing.	Causes and prevention of equine colic in relation to nutrition (The British Horse Society, 2022c, The British Horse Society, 2022b, The Donkey Sanctuary, 2020a, The Donkey Sanctuary, 2020b, Curtis <i>et al.</i> , 2019, Tinker <i>et al.</i> , 1997b, Cohen <i>et al.</i> , 1999, Cohen <i>et al.</i> , 1995, Hudson <i>et al.</i> , 2001, Hassanpour <i>et al.</i> , 2007, Reeves <i>et al.</i> , 1996)
Objective development	Requires owners to select a behaviour change objective based on what they have learnt about nutrition and equine colic. This	To encourage owners to actively participate in decision making and human behaviour change by allowing owners to select a change they want to	Importance of identification of barriers to change (Serra <i>et al.</i> , 2017,

	<b>Overview of content</b>	<b>Reason for inclusion</b>	<b>Source of evidence</b>
	objective must be feasible and take into considerations the social and physical barriers within the community. Owners should discuss exactly how this change will occur.	make and believe will be possible. This ensures owners are aware of the change that is needed and have started to identify and overcome potential barriers to change. This will help to identify changes that will be possible within each specific community.	Shegog and Begley, 2017, Rodriguez <i>et al.</i> , 2018)
Treatment information	Brief description of treatment options that can be used in cases of colic. Mainly focused of reducing pain in equids and improving safety of animal and owner. Time for owners to ask questions.	Limited treatments options available within these communities. However, precautions can be taken to reduce pain/ discomfort in working equids (e.g. use of analgesia available at agrovets, gently walking equid) and ensure equid and owner safety (e.g. removing objects that may cause injury if equid rolled).	Management of equids with colic (The British Horse Society, 2022a)
<b>Leaflet content</b>	Double sided A4 foldable leaflet containing the same ten diagrams showing the signs of colic, a	All information covered in educational workshop optional for owners to take home as a reminder of the signs,	All sources of evidence as above

Overview of content	Reason for inclusion	Source of evidence
<p>diagram showing important aspects of nutrition, and space to write or draw behaviour change objective and treatment plan.</p>	<p>prevention and treatment of colic; and the community change objective.</p>	
<b>Facilitator guide content</b>		
<p>Easy to follow guide to provide facilitators with all information needed to carry out owner education. Included spaces for facilitators to record progress, outcomes and feedback.</p>	<p>To ensure education could be carried out by any facilitator easily without extensive prior training. To ensure all aspects of training were carried out appropriately.</p>	<p>All sources of evidence as above</p> <p>Importance of clear materials and training to improve intervention fidelity (Baker <i>et al.</i>, 2024)</p>

#### 6.4.2 Phase one results

The educational intervention developed in this chapter was made up of an in-person interactive group session aiming to last between one and two hours.

There were five sections to the intervention which were carried out consecutively:

1. Introduction to colic
2. Colic signs activity
3. Nutrition activity
4. Objective development
5. Colic treatment summary

##### Introduction to colic

This was a simple explanation given to owners by researchers. Information that was covered included:

- Association of colic with abdominal pain in horses, donkeys or mules
- Importance of identifying colic
- Importance of prevention of colic to reduce welfare and financial consequences
- Stating that there are a number of causes of colic, including nutrition
- Complexity of equine digestive system (needed to cover small stomach, unable to vomit, long intestines and importance of water to normal gastrointestinal function)

##### Colic signs activity

The second section of the intervention explored ten common signs of colic (Wild, 2018):

- Rolling
- Lying down
- Kicking at abdomen
- Pawing at ground
- Reduced or no droppings

- Flank watching
- Sweating
- Not eating
- Stretching
- Appearing dull or depressed

During this session, owners were given a set of laminated colic sign activity cards with diagrams displaying each of the above ten signs of colic [Figure 22]. Owners were asked to discuss what they were able to see on the cards and state whether they thought it was a sign of colic or not.

#### Nutrition activity

The third section of the intervention explored the causes and prevention of equine colic with regard to nutrition and water provision. Two large posters, one showing a diagram of a 'happy' equid and one showing a diagram of a 'sad' equid were placed up on the wall and participants were provided with "Post-it" notes. Owners were asked to draw or write aspects of equid management relating to feeding and watering practices that contributed to an increase or decrease in the risk of colic and stick them to the posters accordingly (practices that increased the risk of colic would be stuck on the 'sad' equid poster). Owners were asked to discuss the management practices throughout the activity. Once all owners had completed this task, researchers ensured that these were correct and facilitated further discussion if any key points had been missed.

#### Objective development

The fourth section aimed to allow participants to reflect on what they had discussed during the nutrition activity, and develop ideas of changes they could make to reduce the risk of colic for their equids. Owners were asked to select one or two management practices that they currently carry out that they are now aware can increase the risk of equine colic. Owners were then asked to discuss if and how they could change these management practices.

This included discussion around any barriers that they may encounter and how they may be able to overcome these.

### Colic treatment summary

The final section of the intervention involved a simple explanation of treatment methods for equine colic. Due to the lack of veterinary support available within these communities, the suggested treatment options were limited. This section focused on how to keep the equid safe during a colic episode, reducing the detrimental impacts of some home-remedies, gently walking the equid, and if possible providing the equid with pain relief.

#### 6.4.2.1 Supporting resources

There were four supporting resources needed to deliver this intervention:

1. Facilitator guide [Appendix XI]
  - Easy to follow guide provided for researchers that explained how to deliver this intervention.
2. Colic sign activity cards [Figure 22]
  - Laminated cards displaying common signs of equine colic, to be given to owners during the colic sign activity.
3. Nutrition activity set [Figure 23]
  - Laminated posters displaying 'happy' and 'sad' equid, to be given to owners during the nutrition activity.
4. Leaflet [Figure 24, Figure 25, Figure 26, Figure 27]
  - Foldable leaflet summarising content of the educational intervention, to be given to owners at the end up the intervention to take home.

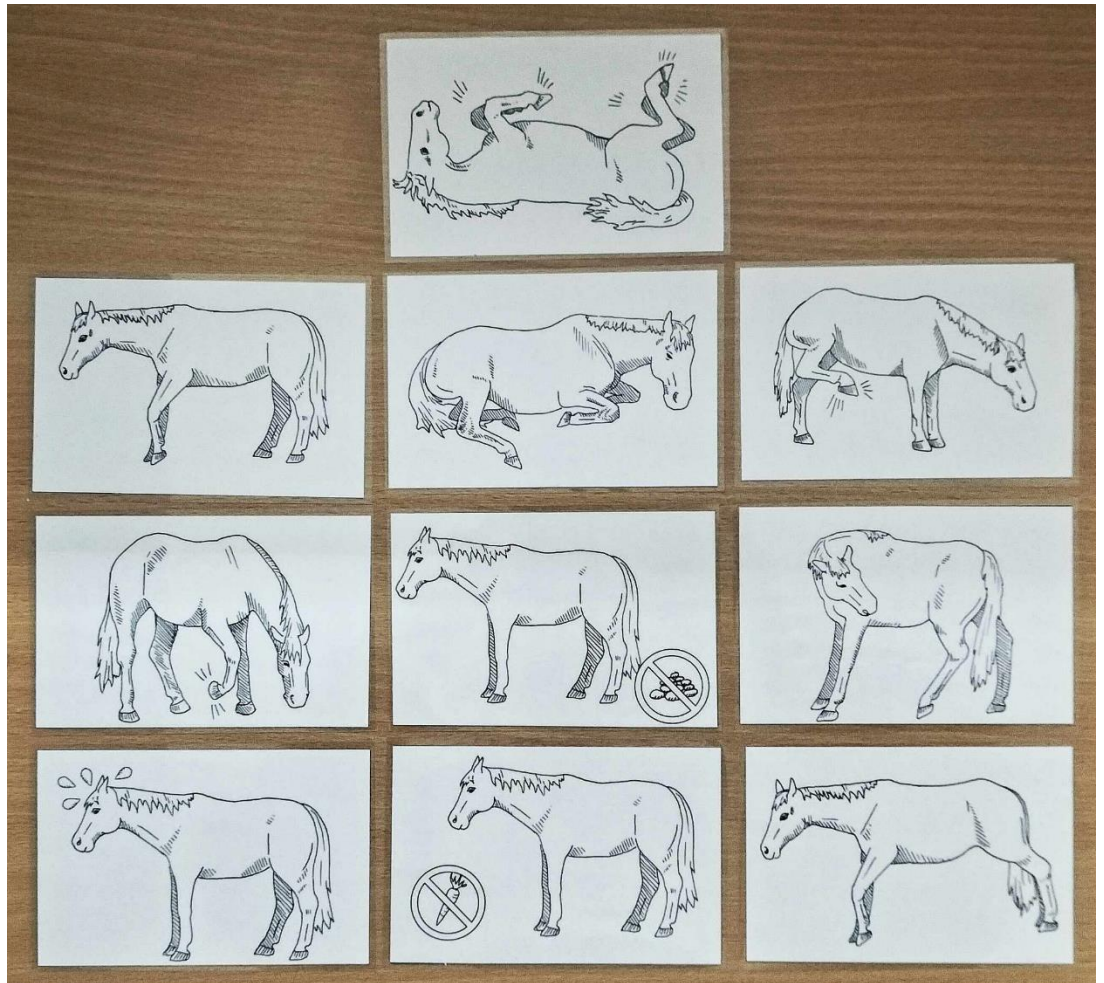


Figure 22: Laminated cards illustrating ten common signs of equine colic, used as part of an educational intervention developed for working equid owners in Colombia.



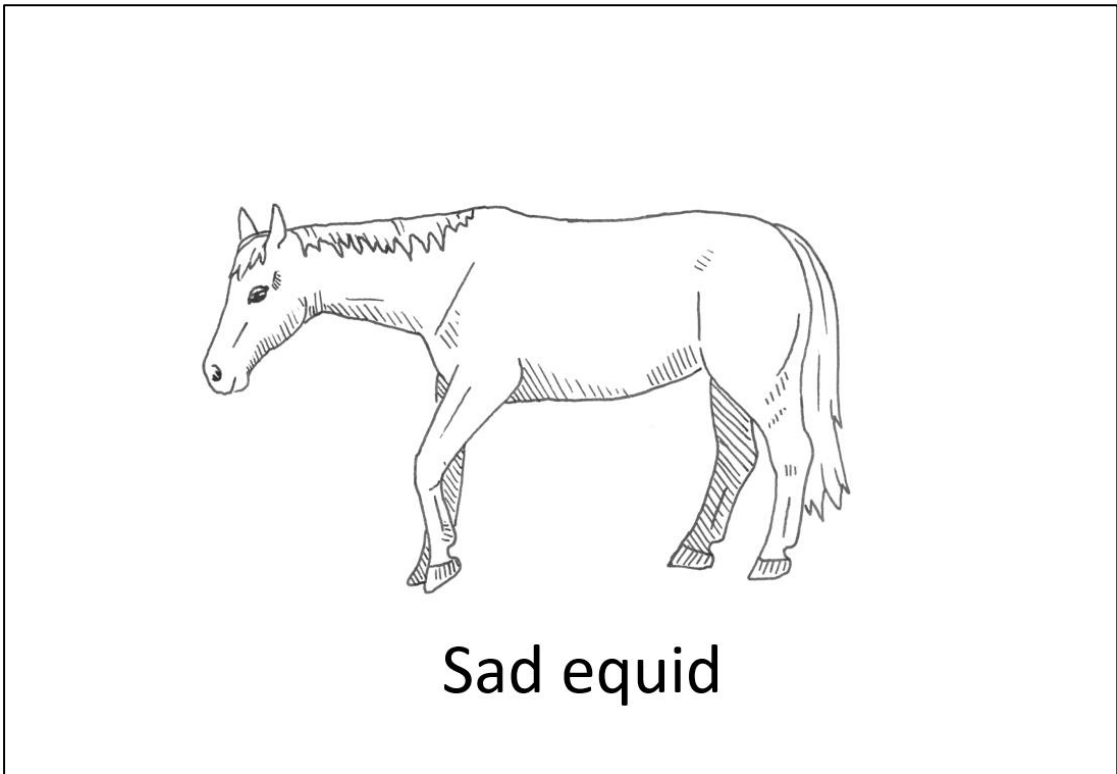
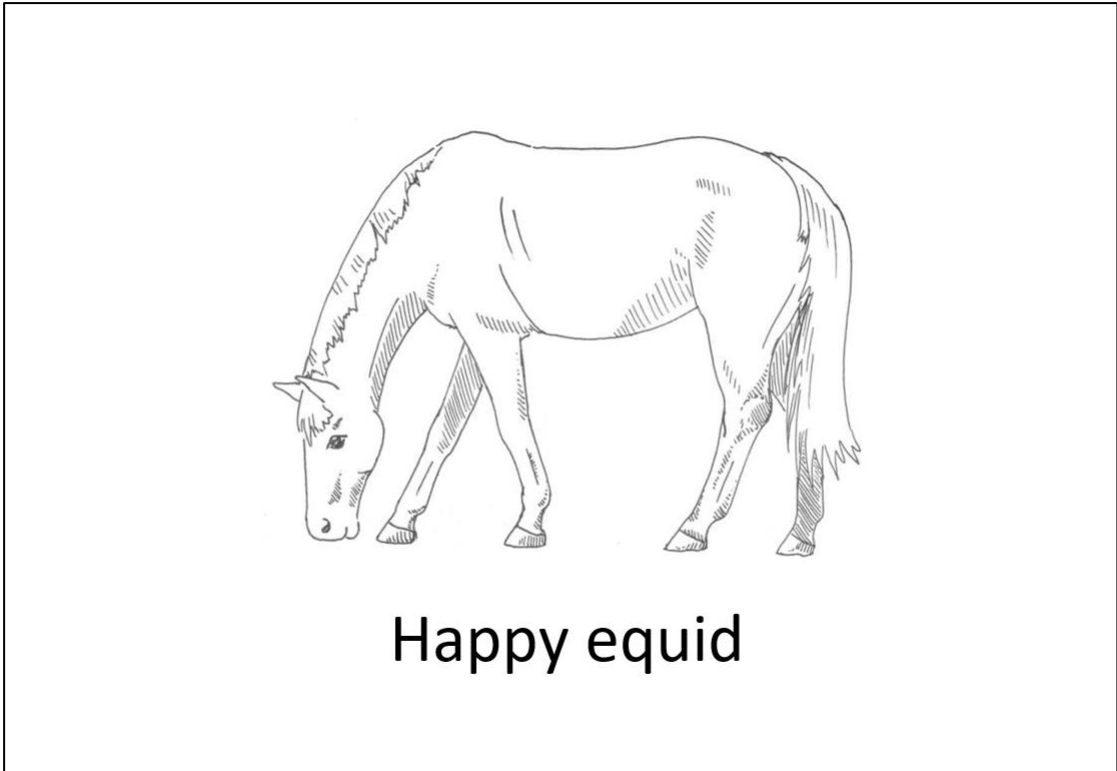


Figure 23: Laminated posters of a happy and sad equid, used as part of an educational intervention developed for working equid owners in Colombia.

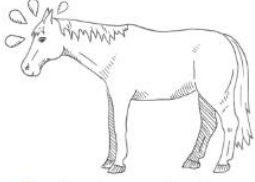
<b>Síntomos de cólicos</b>		
		 <b>Revolcarse</b>
 <b>Deprimido (decaído/triste)</b>	 <b>Acostado (echado)</b>	 <b>Pateándose el abdomen (barriga)</b>
 <b>Escarba el piso con desespero</b>	 <b>No defeca</b>	 <b>Se mira o muerde flancos (costados)</b>
 <b>Suda demasiado</b>	 <b>Come poco o no come</b>	 <b>Estirándose</b>
<b>Manejo del cólico, paso a paso</b>		

Figure 24: Side one of a leaflet showing the signs of equine colic and providing a space to write/ draw a treatment place, used as part of an educational intervention developed for working equid owners in Colombia.

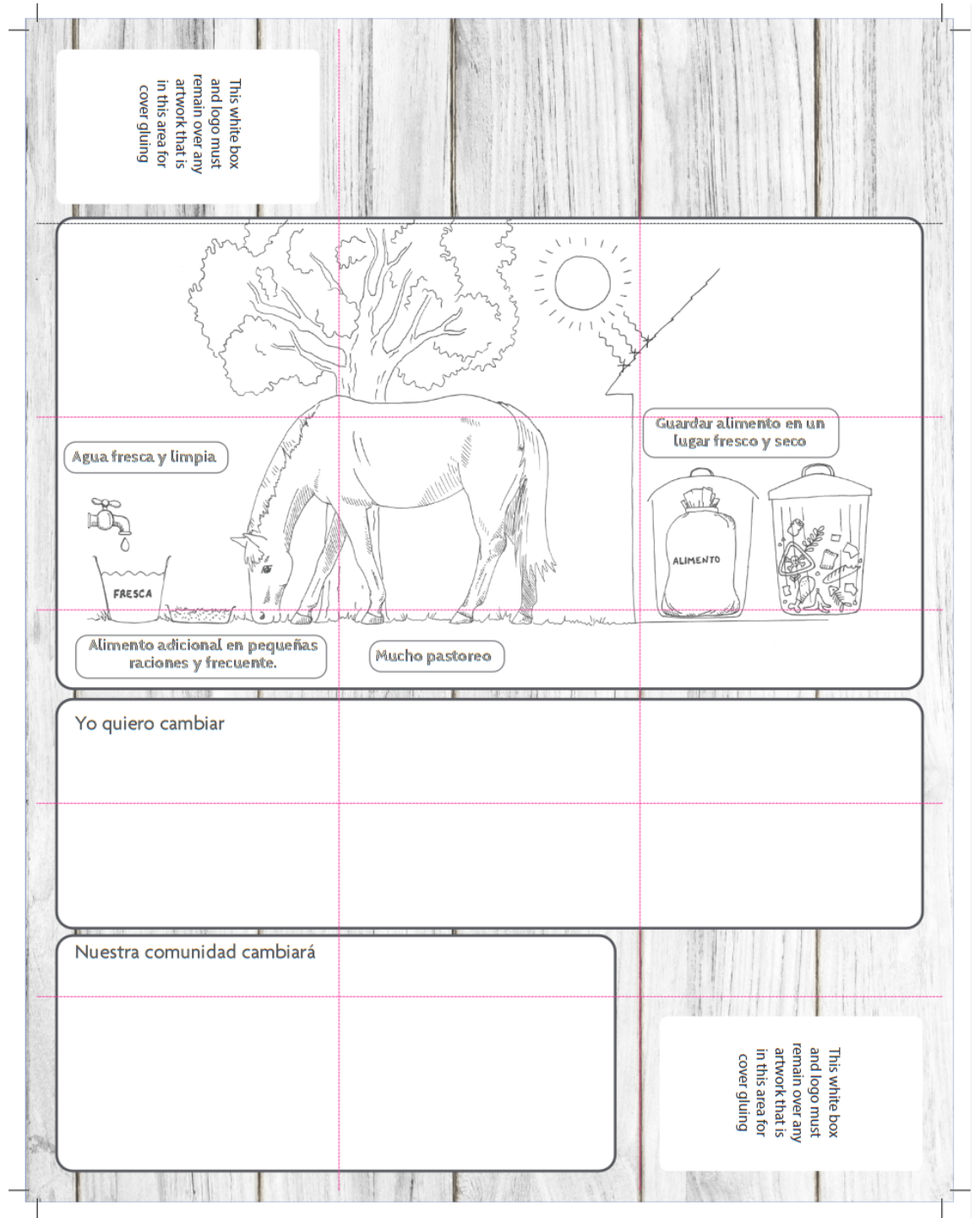


Figure 25: Side two of a leaflet showing aspects of equid management needed to reduce the risk of colic, and providing a space to write/ draw community and individual behaviour change objectives, used as part of an educational intervention developed for working equid owners in Colombia.



Figure 26: Front of leaflet once completely folded showing the contributing individuals and organisations, used as part of an educational intervention developed for working equid owners in Colombia.



Figure 27: Back of leaflet once completely folded showing the contributing individuals and organisations, used as part of an educational intervention developed for working equid owners in Colombia.

## 6.5 Phase two: Evaluation of educational intervention

### 6.5.1 Phase two methods

Evaluation of the educational intervention used a mixed-methods approach and involved three components:

- 1. Knowledge assessment survey:** Longitudinal study assessing working equid owner knowledge before, directly after and three months after the educational intervention was delivered.
- 2. Owner feedback:** Focus groups carried out with working equid owners who had attended the educational intervention to assess owner reported changes in behaviour and management, along with gaining feedback on the content and process of the educational intervention.
- 3. Research team feedback:** Short qualitative questionnaire with the research team involved in delivering the educational intervention gaining general feedback on the delivery and content of the educational intervention.

Observational case studies were also conducted within each community and are included in Appendix XI but were not analysed and are not included in this thesis.

#### 6.5.1.1 Knowledge assessment survey

##### Sample population

Four communities across Colombia (Andes, Apartado, Cocorna and Kütünsuma) received the educational intervention and participated in the evaluation of the programme. These communities were all also involved in the development of the programme.

##### Participant recruitment

Participant recruitment was the same as previous chapters (Chapters Three, Four and Five).

##### Study development

The survey (Appendix XII, Appendix XIII) was developed to gather data on the perception and knowledge of colic within working equid communities.

Questions focused on owner knowledge of the signs and causes of equine colic. The survey was conducted at three points across a three month period to compare any changes throughout the dissemination of the programme.

1. **Round 1:** February 2023 - prior to delivery of educational programme
2. **Round 2:** February 2023 - immediately after delivery of educational programme
3. **Round 3:** May 2023 - three months after delivery of educational programme

#### Knowledge assessment survey development

Round one of the survey was formed of nine questions split into two sections:

1. Perception and knowledge of equine colic
2. Current equid management with regard to nutrition

Questions were a mixture of free text, multichoice and ten-point rating scale questions. This survey was completed immediately before the start of the educational programme.

The second round was completed immediately after the educational programme. This round was formed of 12 questions split into three sections:

1. Feedback on the educational programme
2. Perception and knowledge of equine colic
3. Intention to change current equid nutrition management

Survey questions on the perception and knowledge of colic were identical to round one to allow for direct comparison. Questions were a mixture of free text, multichoice and ten-point rating scale questions.

Following feedback from round one and two, which suggested participants had difficulty completing survey questions, it was decided to reduce the

survey to three questions investigating the knowledge and perception of equine colic for the final round.

#### Data collection

Data collection was carried out by in-country researchers from Universidad de CES (SH, CG, HD) and Fundación Arrieros Colombia (CJ and SP). Surveys were carried out in person on paper, and answers were later uploaded to Microsoft Forms and translated to English where appropriate by students from Universidad de CES (CG and HD). Questions on the signs and causes of colic were given to participants as free text, and when uploaded onto Microsoft forms, answers were categorised into pre-defined answers with an option for 'other' for any answers that did not fit pre-defined answers. Participants were provided support from staff from Universidad de CES (SH, CG and HD) and Fundación Arrieros Colombia (CJ and SP) where needed.

#### Data analysis

Data from all three rounds of the knowledge assessment survey were exported from Microsoft Forms into Excel (Microsoft Office 365, Microsoft) to allow for data cleaning and analysis. Descriptive analysis was carried out on non-parametric data and reported using the median and IQR. Free text responses were reviewed individually and were categorised into pre-existing answers or removed if incorrect or unclear. Data was compared between rounds one, two, and three of the survey. A control group who had not attended the educational intervention were compared against participants who had attended the educational intervention during the third round of the survey.

#### 6.5.1.2 [Owner feedback focus groups](#)

##### Sample population and participant recruitment

Sample population and participant recruitment were the same as above. Owners who had heard about the education and research through other friends, family or owners were also welcome to attend. However, each focus

group was required to contain at least three owners who had attended the educational intervention.

#### Study development

A semi-structured focus group guide was developed with a total of six questions [Appendix XV]. An additional set of focus group questions were developed to be used if there were few or no participants who had attended the educational intervention [Appendix XV]. These questions focused on suggestions for education within working equid communities.

#### Data collection

Focus groups were carried out in Spanish by in-country researchers from Universidad de CES (SH) and Fundación Arrieros Colombia (CJ). Participants were required to give verbal consent prior to the focus group. All focus groups were audio recorded.

#### Research team and reflexivity

Research team and reflexivity was the same as all previous chapters.

#### Setting of data collection

Setting of data collection was the same as previous chapters (Chapters Three and Five).

#### Data analysis

#### Translation and transcription

All focus groups were audio recorded; translation and transcription were carried out simultaneously in country by Universidad de CES (OG). Transcripts were reviewed by the primary researcher to check for clarity. Participants did not review transcripts prior to coding.

#### Coding and theme generation

Data handling and coding was carried out using NVivo 12 software. Coding was carried out deductively with codes referring to recalled information from



the educational intervention and owner reported changes in their behaviour and management of their equids.

A codebook was compiled following coding of all transcripts. This codebook was then used to double code the transcripts by a secondary coder (KB) to improve reliability (Morse, 2015). Following discussion between coders, no further changes were identified to the coding structure. Following coding, codes were categorised to identify themes.

### 6.5.1.3 Research team feedback

#### Inclusion criteria

The sample population required for this study included all individuals who were involved in the delivery of the educational intervention. This included university staff and students from Universidad de CES and researchers from Fundación Arrieros Colombia. As all required participants were active members of the research team, they were all emailed directly to inform them about the questionnaire.

#### Questionnaire development

A total of nine open ended questions were developed [Appendix XVI]. Questions covered the quality and quantity of the educational intervention content, their perceptions on participant engagement throughout the intervention, and the ease of delivery methods and process of the intervention for both researchers and owners.

#### Data collection

The questionnaire was developed on a Microsoft Word document. All participants were emailed the questionnaire on 9<sup>th</sup> August 2023 and were given one month to complete it. All questions and answers were given in English.

## Data analysis

### Coding and theme generation

Data handling and coding was carried out using NVivo 12 software. All transcripts were deductively coded and codes were then categorised appropriately.

#### 6.5.2 Phase two results

The analysis of this data set was conducted in two parts:

1. Comparison of participants that completed round one, two and three of the survey
2. Comparison of round three comparing ten participants who attended the educational intervention with the 11 participants who did not attend the educational intervention

##### 6.5.2.1 Knowledge assessment surveys

#### Comparison of round one, two and three

Results are reported by questions with results from all three rounds being compared simultaneously.

Forty participants completed the first survey, thirty-nine participants completed the second survey and ten participants completed the third survey [Table 9].

Table 9: Participant demographics in round 1, 2 and 3 of a longitudinal survey of Colombian working equid owners knowledge and experience of colic.

	<b>ROUND ONE</b>	<b>ROUND TWO</b>	<b>ROUND THREE</b>
<b>KUTUNSUMA</b>	10	9	2
<b>COCORNA</b>	9	9	6
<b>ANDES</b>	15	15	2
<b>APARTADO</b>	6	6	0
<b>TOTAL</b>	40	39	10

When asked how concerned owners were in relation to colic a median score of ten (with 0 being not concerned and 10 being very concerned) was given in all three rounds of the survey. When asked how important it was to prevent colic a median score of ten (with 0 being not important and 10 being very important) was given in all three rounds of the survey. A median score of ten (with 10 being the highest) was given when participants were asked if they found the educational intervention interesting, felt the education improved their knowledge, and felt the education encouraged them to make daily changes to their equids management.

When asked what signs would indicate equine colic, participants correctly identified a median number of three signs (IQR 2-4) during the first round of the survey. This increased to a median of five signs (IQR 3.5-6) identified by participants during the second survey. During the third survey a median of 5.5 signs (IQR 5-6) were identified [Figure 28].

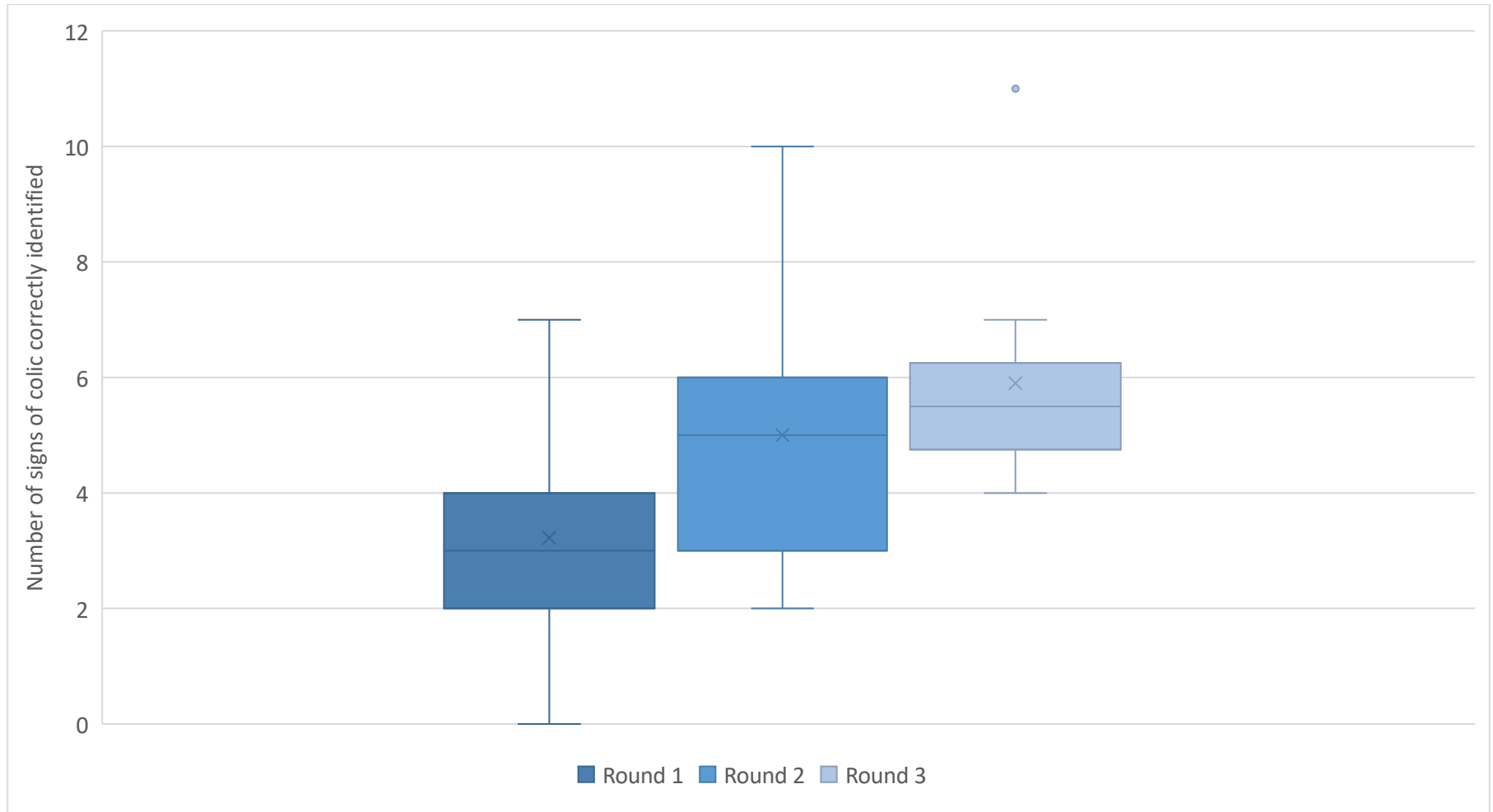


Figure 28: Box and whisker plot showing the median and IQR number of signs of equine colic identified by participants in round 1 (n=40), 2 (n=39) and 3 (n=10) of a longitudinal survey of Colombian working equid owners knowledge and experience of colic.

The most common signs identified by participants across all surveys were rolling (83% n=33/40; 87% (n=34/39); 100% (n=10/10)), lying down (70% (n=28/40); 85% (n=33/39); 100% (n=10/10)), restless/ agitated (38% (n=15/40); 41% (n=16/39); 60% (n=6/10)), and pawing at the ground (35% (n=14/40); 62% (n=24/39); 70% (n=7/10)). The most improved reported signs throughout the surveys were flank watching (8% (n=3/40), 26% (n=10/39), 70% (n=7/10) and pawing at the ground (35% (n=14/40); 62% (n=24/39); 70% (n=7/10))[Figure 29].

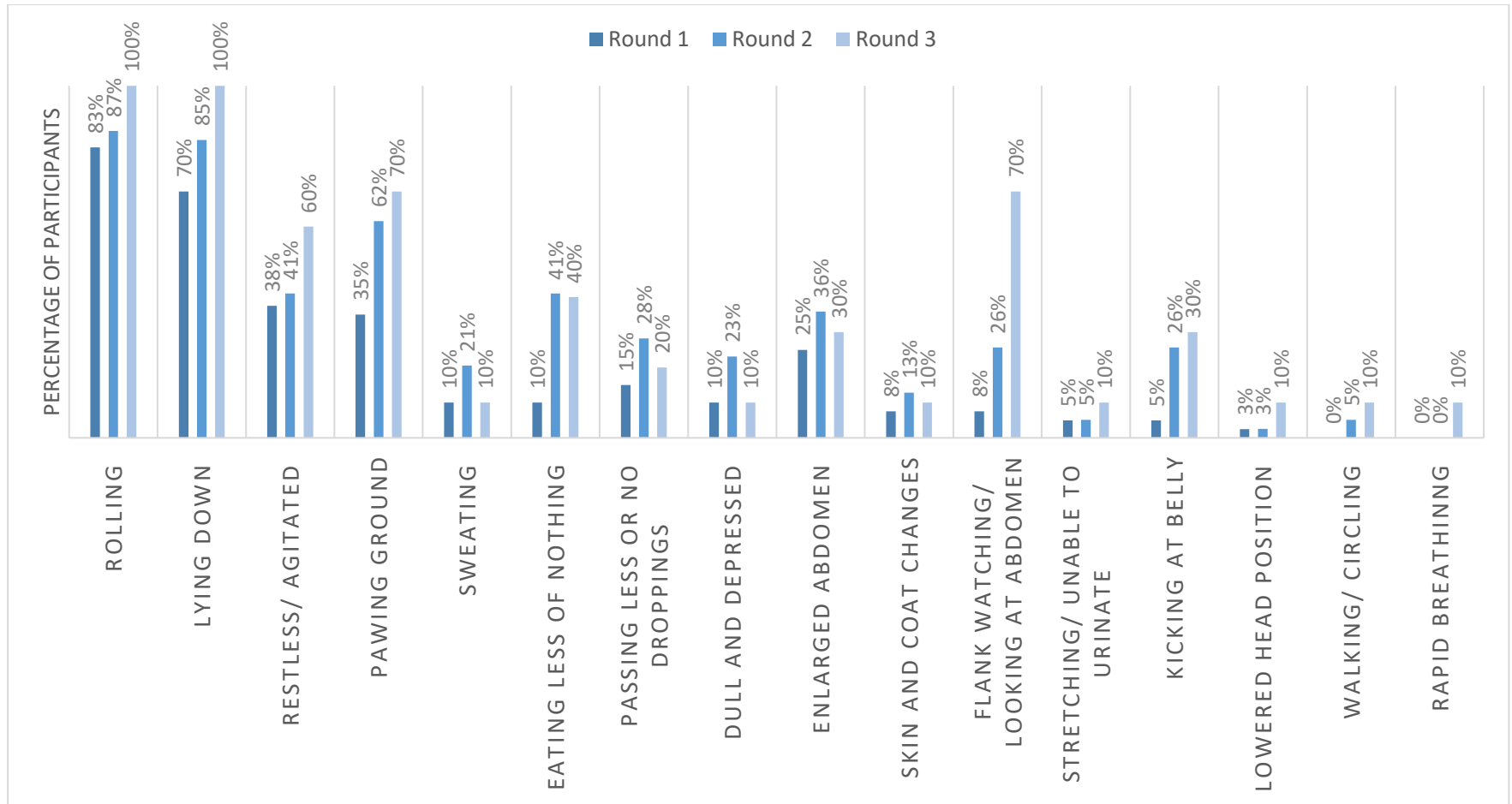


Figure 29: Bar chart showing the signs of equine colic identified by participants in round 1 (n=40), 2 (n=39) and 3 (n=10) of a longitudinal survey of Colombian working equid owners knowledge and experience of colic.

During the first survey, participants identified a median of two causes (IQR 1-3) of equine colic. This increased to a median of three causes (2-4.5) of colic in the second survey, and a median of five causes (5.25-6) during the third survey [Figure 30].

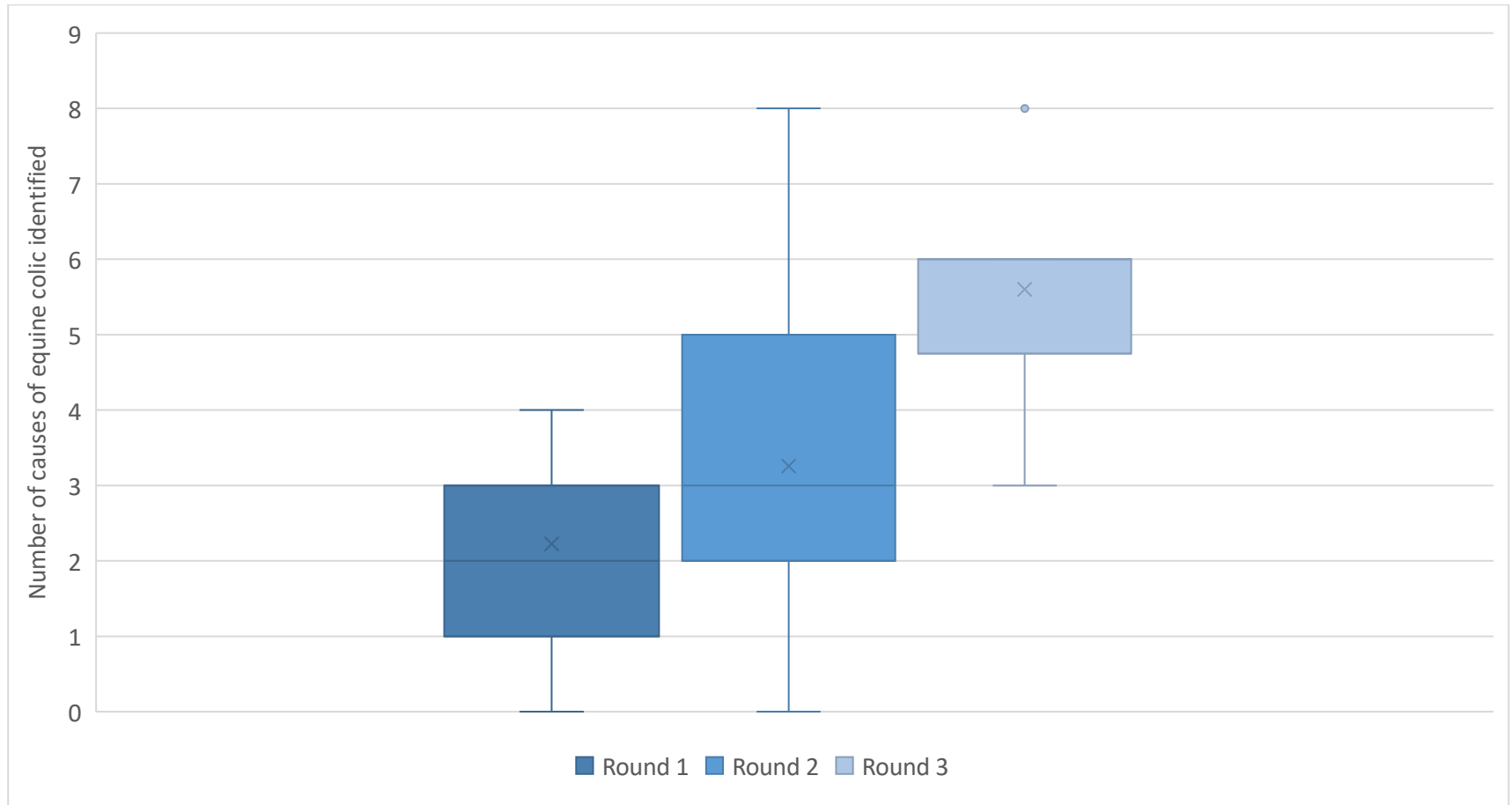


Figure 30: Box and whisker plot showing the median and IQR number of causes of equine colic identified by participants in round 1 (n=40), 2 (n=39) and 3 (n=10) of a longitudinal survey of Colombian working equid owners knowledge and experience of colic.



The most commonly identified causes of equine colic throughout the three surveys were ingestion of contaminated feed (43% (n=17/40); 72% (n=28/39); 100% (n=10/10)), feeding inappropriate feed (35% (n=14/40); 44% (n=17/39); 100% (n=10/10)), consumption of contaminated water (30% (n=12/40); 41% (n=16/39); 50% (n=5/10)), and feeding too much concentrate (15% (n=6/40); 28% (n=11/39); 60% (n=6/10)). The largest increase in the frequency of reported causes of colic was seen for feeding inappropriate feed (35% (n=14/40); 44% (n=17/39); 100% (n=10/10)) [Figure 31].

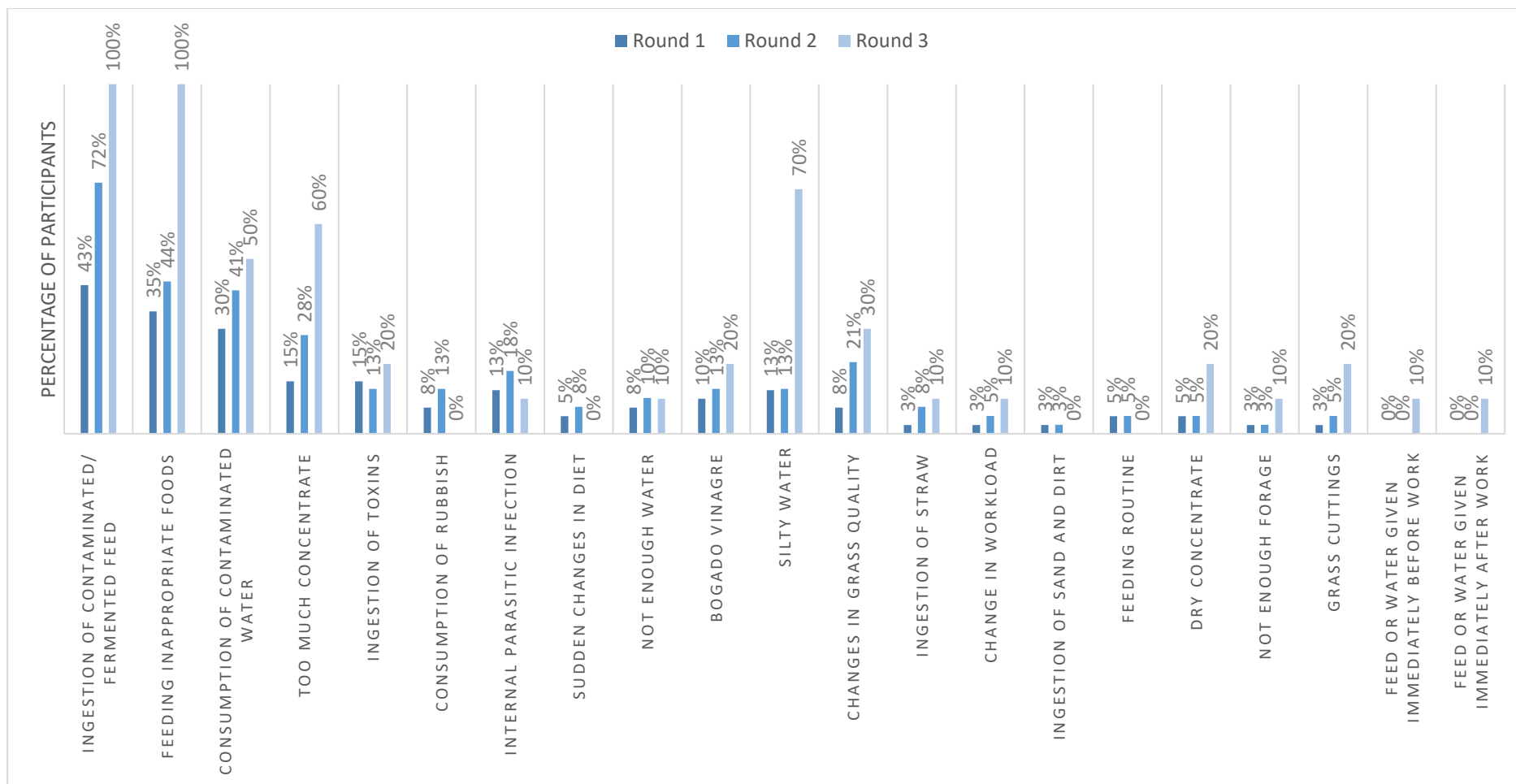


Figure 31: Bar chart showing the causes of equine colic identified by participants in round 1 (n=40), 2 (n=39) and 3 (n=10) of a longitudinal survey of Colombian working equid owner's knowledge and experience of colic.

### Comparison of round three: control vs intervention group

During the third round of the survey, ten participants who completed the survey had attended the educational intervention three months previously, and eleven participants had not attended the educational intervention and were used as a control group.

The intervention group was made up of two participants from Andes, two participants from Santa Marta, and six participants from Cocorna. The control group was made up of one participant from Cocorna, three from Apartado and seven from Andes.

The median number of identified signs of colic for the intervention group was 5 (IQR 4-5 signs) signs. The control group identified a median number of 4 (IQR 3-5 signs) signs of colic [Table 10].

The median number of causes of colic identified by participants in the intervention group was 4 (IQR 4-4 causes) causes. The median number of identified causes of colic in the control group was 3 (IQR 2.5-3.5 causes) causes [Table 10].

Table 10: Table showing the median and IQR number of signs and causes of equine colic identified by participants by participants in the intervention and control group in round three of a longitudinal survey of Colombian working equid owner’s knowledge and experience of colic.

	<b>PARTICIPANT GROUP</b>	<b>MEDIAN</b>	<b>INTERQUARTILE RANGE</b>
<b>SIGNS OF COLIC</b>	Intervention	5	4-5
	Control	4	3-4
<b>CAUSES OF COLIC</b>	Intervention	4	4-4
	Control	3	2.5-3.5

The most frequently identified signs identified within the intervention group were lying down (100% n=10/10), rolling (90% n=9/10), flank watching (70% n=7/10), and pawing the ground (60% n=6/10). The most commonly identified signs of colic within the control group were lying down (82% n=9/11), rolling (73% n=8/11), and restlessness/ agitation (55% n=6/11) [Figure 32].

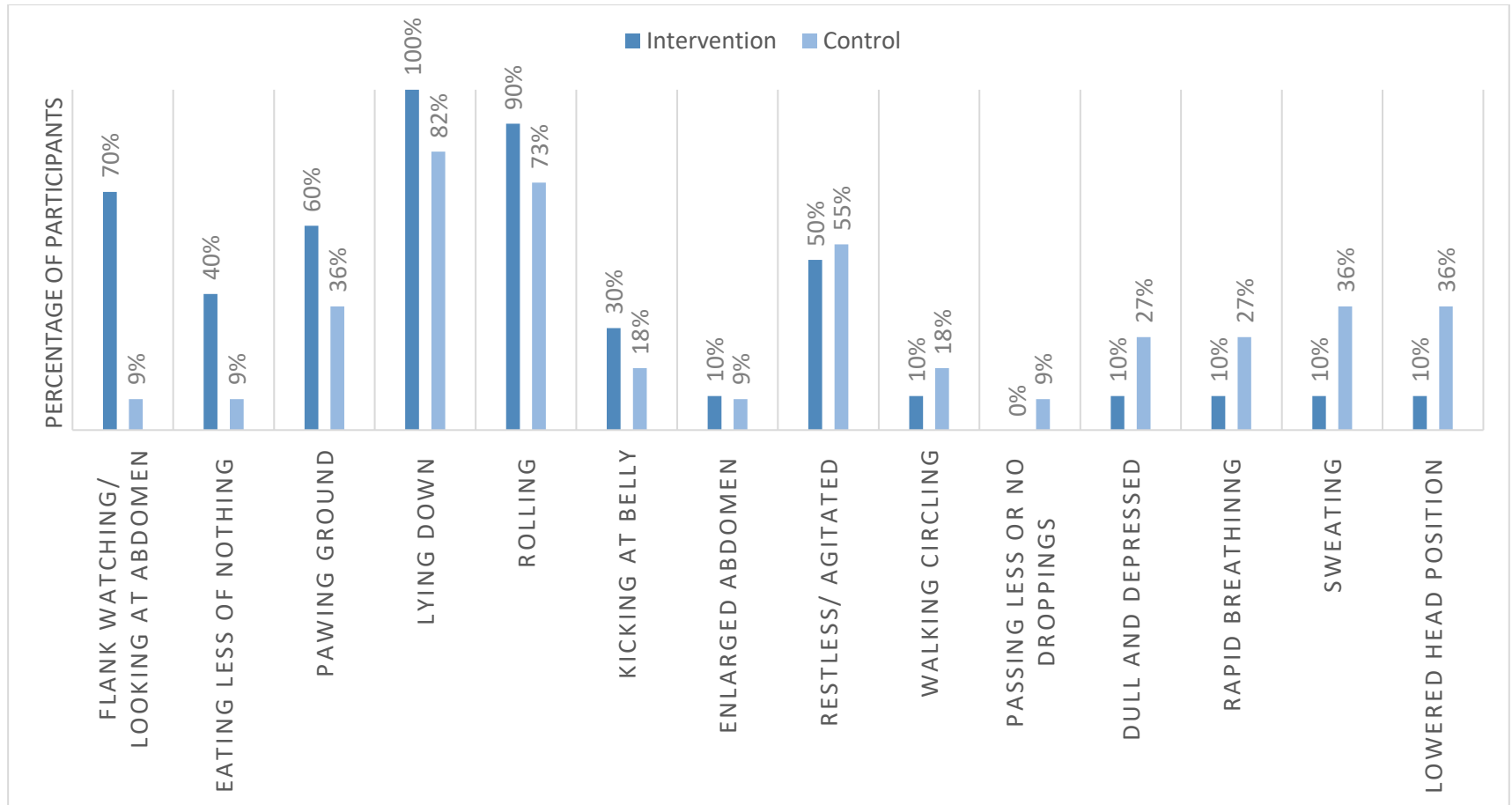


Figure 32: Bar chart showing the signs of equine colic identified by participants in the intervention (n=10) and control (n=11) group in round three of a longitudinal survey of Colombian working equid owner's knowledge and experience of colic.

The most frequently identified causes of colic in the intervention group were feeding inappropriate foods (100% n=10/10), ingestion of contaminated/fermented feed (90% n=9/10), and silty water (70% n=7/10). The most frequently identified causes of colic in the control group were ingestion of contaminated/fermented feed (91% n=10/11), feeding inappropriate foods (55% n=6/11), silty water (55% n=6/11), and consumption of contaminated water (55% n=6/11) [Figure 33].

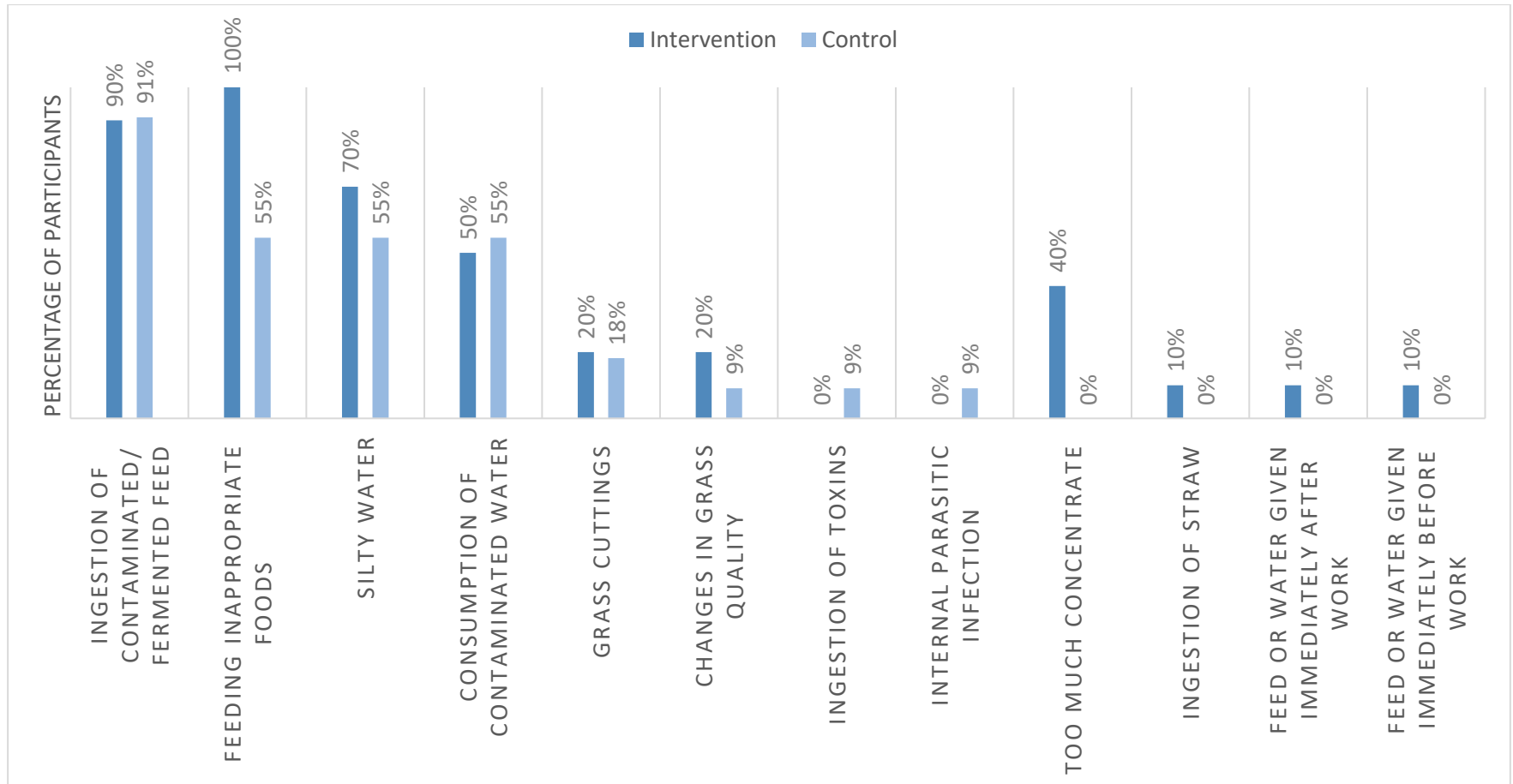


Figure 33: Bar chart showing the causes of equine colic identified by participants in the intervention (n=10) and control (n=11) group in round three of a longitudinal survey of Colombian working equid owner's knowledge and experience of colic.

### 6.5.2.2 Owner feedback focus groups

#### Demographics

A total of four focus groups were carried out across four regions in Colombia in May 2023. The focus group carried out in Kütünsuma was not included in the owner feedback focus group analysis as there were no participants who had attended the educational intervention in February 2023. Instead, this focus group covered similar content to focus groups carried out in Chapter Five of this thesis. This focus group has not been analysed and will not form part of the results.

In all other communities, focus groups included a mixture of participants who had attended the educational intervention and those who had not. The additional set of focus group questions developed to be used if there were few or no participants who had attended the educational programme was not required to be used. All owners were over the age of 18 and had current involvement in the care of working equids.

Thematic analysis identified three overarching themes:

1. Awareness and understanding of education content
2. Intention and development of ideas for change
3. Evidence of and action towards behaviour change

Each of these themes interacted and led to the next step towards behaviour change.

#### Awareness and understanding of education content

Throughout focus groups, participants were able to recall that the educational intervention was about equine colic. Some owners were able to further expand on the content to name the specific signs, causes and treatment of colic. The signs of colic that owners were able to recall included kicking at the ground, rolling, appearing dull or depressed, flank watching, restlessness and lying down. One owner from Cocorna identified how restlessness and rolling could result in an equid becoming injured further.



*“The constant gaze of the horse at the haunch... constant stomping... wallowing on the ground with a tendency to get hurt... a fracture or anything related.” – Owner from Cocorna*

In addition to this, some owners showed a greater level of understanding by expanding on their explanations of the causes and prevention of equine colic. Owners were able to show that they understood the reasoning behind some of the causes of colic.

*“They eat garbage and a plugging is formed in the stomach and that is why it also gives colic, by the plugging with paper garbage, cob, bags and if it is a bag of panela eats it quickly.” – Owner from Apartado*

#### Intention and development of ideas for change

Owners from Apartado and Cocorna discussed management changes that were needed to reduce the risk of equine colic. In Cocorna, this included reducing the volume of ‘sugar water’ given to equids. In Apartado, owners stated that they need to reduce the access equids have to rubbish, examples of how this could be done included avoiding areas where there was lots of litter and avoiding taking rubbish out before rubbish collection day.

*“The garbage must be taken out on a specific day when the car passes, if you take it out a day before you affect the animals.” – Owner from Apartado*

Owners discussed the challenges they had faced that act as a barrier for change. A lack of resources for managing colic was highlighted by owners in

Cocorna. Owners in Apartado suggested that prevention of colic through rubbish management was impossible, highlighting regional differences.

#### Evidence of and action towards behaviour change

In all communities, owners reported that there had been some change to the management of working equids arising from the educational intervention. In Apartado, it was clear that whilst there had been some improvement in the management of rubbish, this was still a problem and participants were aware that further change was needed.

In Andes, one owner discussed how they had started to remove old feed and use it as fertiliser, where previously they would have fed this to the equid.

*“I would put salt on the left-over concentrate from the day before... now I don't... I use it as fertilizer...”- Owner from Andes*

Other examples of changes that owners had made included providing their equid with fresh water every day and increasing the amount of ‘imperial’ grass fed to equids.

In Cocorna, owners discussed how they had reduced the volume of ‘honey water (sugar-water)’ offered to equids and one owner stated that they had built a cover for where they keep feed to avoid it being exposed to the sun to reduce the risk of fermentation.

*“I fixed it... I put a good roof on it... now it is in the shade all day... now neither the molasses nor the concentrate is exposed to the sun...” – Owner from Cocorna*

Owners also reported that they had changed their treatment method for colic and had gently walked their equid when it showed signs of colic. One owner discussed the transfer of knowledge within the community, stating that they were able to share the knowledge that was gained from attending the educational intervention and support other individuals living within the community. This example showed how one owner had identified a case of colic in another individual's equid and had advised them to untack, cool and gently walk the equid.

*“There was a horse-back ride from here to San Francisco, so when we started going up the river, two mules and a horse got dizzy and one began to tremble... the rider got off the horse and pulled it a while by the halter... so I saw the horse that way and told him that the horse was sick and he asked me what to do and I told him to unsaddle it and bathe it completely... he bathed it, but the horse continued trembling... some people told him to let it loose and I told him it would be worse... the best to do is to walk it because I was in a training related to that and they recommended to walk it for about thirty minutes until it gets well... the man did so and when I caught up with him, the horse was a lot better... and when we got to town , they gave it medicine and now the horse is well...” – Owner from Andes*

#### 6.5.2.3 Research team feedback

Feedback on the guide was collected from researchers involved in the delivery of the educational intervention. Codes were grouped into three categories; positive feedback, challenges, and suggested improvements [Table 11].

Positive feedback included appropriate content, engaging delivery, and evidence of impact. The education content was reported as easy to understand, relevant to owners, and addressed a common problem. Research team members stated that the supporting material for the educational intervention was beneficial, including the colic signs and nutrition activities,

and the leaflet. The images and basic words used in these paper-based materials were highlighted as vital to owner understanding. Due to the voluntary involvement of equid owners, there was active engagement of owners throughout the educational interventions. Research members stated that the relationship between themselves as researchers and the owners was a key part in the participation in the educational intervention. They also described seeing evidence that the educational intervention improved owners knowledge, motivation to change and behaviour change.

Challenges that were reported throughout the questionnaires included the owner not understanding aspects of the education, difficulties with changing perceptions and behaviour, a lack of participation, and participant fatigue as a result of the two rounds of the survey. A lack of understanding of the educational content was attributed to low levels of literacy, difficulties with unfolding the leaflet, and misunderstanding the concept behind developing a community objective. Many owners have used traditional methods of managing and caring for working equids and encouraging change around these practices is extremely challenging. Community specific barriers that were identified included a lack of motivation to engage in the educational intervention in Apartado. In this region, owners were required to replace their equids with motorised vehicles within the near future, and as a result owners were more reluctant to learn about the equids. In Kütünsuma, it was highlighted that very few participants were able to attend more than one visit and therefore it was more challenging to identify any impact the educational intervention had within this community. It is important to note that before and after the educational intervention was delivered, owners were required to complete a short survey. Research team members reported that the completion of this survey caused significant participant fatigue and made it more challenging for owners to engage for the full duration of the educational intervention.

Suggested improvements included the use of additional delivery methods such as more practical activities, posters and videos. Researchers discussed

increasing inclusivity and accessibility by further reducing the amount of wording used and required during the intervention and engaging younger generations in interventions and education. Researchers highlighted that it was important to continue to visit these communities to further support and education owners on equid care and welfare, with further in person visits strengthening the relationship between researchers and owners.

Table 11: Summary of categories identified during content analysis of research team feedback qualitative questionnaires.

Category	Sub-categories and further details	Relevant quotes
<b>Positive feedback</b>	Appropriate content <ul style="list-style-type: none"> <li>- Easy to understand</li> <li>- Relevant to owners</li> <li>- Address a common problem</li> </ul>	<p><i>“I think that the content of the trainings was understood by the owners thanks to the aids that were used, such as posters and surveys, and also by the language used to explain the topics.” – P5</i></p> <p><i>“I think the way the project was developed was very effective, the objectives were achieved and without a doubt the owners were left with a very clear idea of what colic is, how they can identify it, how to prevent it and what to do if it occurs.” – P3</i></p>
	Engaging delivery <ul style="list-style-type: none"> <li>- Relevant supporting material</li> <li>- Interactive and engaged participants</li> </ul>	<p><i>“Really in the communities where we work, we have had a positive relationship and that helped the development of the project. They believe in us and know that everything we bring to the community is to improve, so they all participated.” -P2</i></p>

Category	Sub-categories and further details	Relevant quotes
	<ul style="list-style-type: none"> <li>- Researcher-participant relationships</li> </ul>	<p><i>“Most of the owners were very attentive and interested during the trainings, making contributions and asking questions.”- P5</i></p> <p><i>“The way in which the talks were given and the complementary activities that were carried out, helped to make the information much clearer. In addition, the materials used made the training very didactic so that the owners did not get bored.”- P5</i></p>
	<p>Evidence of impact</p> <ul style="list-style-type: none"> <li>- Improvement of owner’s knowledge</li> <li>- Education encouraged change</li> <li>- Evidence of behaviour change</li> </ul>	<p><i>“According to the activities we had throughout the months, we could see that they learned basic concepts and kept them in mind every time we met.” – P2</i></p> <p><i>“We could also see this when we went to the sites for the second time, because when we did the surveys again, most of the answers were correct.” – P5</i></p> <p><i>“It was a real pleasure to see positive changes for animal welfare and human welfare.” – P1</i></p>

Category	Sub-categories and further details	Relevant quotes
<b>Challenges</b>	<p>Owner understanding of education</p> <ul style="list-style-type: none"> <li>- Low levels of literacy</li> <li>- Misunderstanding objective development section</li> <li>- Difficulties with unfolding leaflet</li> </ul>	<p><i>“One of the challenges has always been to find the best language to bring all the knowledge to the communities. And not knowing how to read or write some owners in the communities was also a challenge.” – P2</i></p> <p><i>“It was very difficult to explain the agreements of the community, I think that in some moments it is easier to get individual results.”- P1</i></p> <p><i>“Maybe I would think about future projects, the shape of the brochure could be different, some owners got confused with how to fold it. and that they may not have to write to facilitate their development.” – P5</i></p>
	<p>Difficulties with changing perceptions and behaviour</p> <ul style="list-style-type: none"> <li>- Previous use of traditional methods of equid care and management</li> </ul>	<p><i>“I think that one of the main challenges is to get them to put aside some practices that they have used for years and for which they present positive arguments but that undoubtedly go against good practices and animal welfare.” – P5</i></p>



Category	Sub-categories and further details	Relevant quotes
	Lack of participation <ul style="list-style-type: none"> <li>- Replacement scheme in Apartado</li> <li>- Few returning participants in Kütünsuma</li> </ul>	<p><i>“Apartadó: People committed to education, but the replacement of animal-drawn vehicles affects the sustainability of the process.” -P1</i></p> <p><i>“Kütünsuma: They are not constant in the participation of the calls.” – P1</i></p>
	Participant fatigue as a result of the surveys	<p><i>“I think the most challenging part for the owners was when they had to fill out the surveys, because many of them do not know how to read neither how to write.”- P5</i></p> <p><i>“The completion of surveys at the beginning and at the end was tedious for the communities, which made the process very long.”- P1</i></p>
<b>Suggested improvement</b>	Additional delivery methods <ul style="list-style-type: none"> <li>- Practical activities</li> <li>- Posters</li> <li>- Videos</li> </ul>	<p><i>“You could think of more practical activities for a future project in terms of carrying a horse's digestive system or painting the entire digestive system on a horse so that the owners get an idea of reality.” – P2</i></p>

Category	Sub-categories and further details	Relevant quotes
	Increasing inclusivity and accessibility <ul style="list-style-type: none"> <li>- Reduced word use and requirements</li> <li>- Inclusion of younger generations</li> </ul>	<p><i>"Maybe I would think about future projects, the shape of the brochure could be different, some owners got confused with how to fold it. and that they may not have to write to facilitate their development." – P2</i></p> <p><i>"Include future generations (children and adolescents) in education processes." – P1</i></p>
	Frequent visits in the future <ul style="list-style-type: none"> <li>- Strengthen understanding of equid health</li> <li>- Provision of continued support</li> <li>- Maintain researcher- participant relationships</li> </ul>	<p><i>"I believe that more frequent visits addressing other issues related to the welfare of the equines would guarantee an excellent educational process, since concepts would be strengthened and the trust of the community in the work team would be reaffirmed." – P3</i></p> <p><i>"Doing trainings constantly, and not only 1 or 2 times, because the owners after these trainings feel very encouraged and wanting to change many things, but if they are not followed up, they will leave behind the information received."- P5</i></p>

## 6.6 Discussion

### 6.6.1 Overview of findings

This chapter incorporated research findings from previous chapters in this thesis, existing literature, and input from a number of stakeholders to produce a targeted educational intervention aimed at working equid owners in Colombia. The educational intervention developed covered a basic understanding of the definition, signs, causes, and treatment of equine colic; the importance of nutrition and water management in the prevention of colic; and provided owners with the opportunity to develop their own objectives for change. Ultimately the intervention aimed to reduce the risk of equine colic within these working equid populations in Colombia. This required owner behaviour change with regard to equid related management practices.

This intervention included participatory methods such as group discussions, interactive activities, and owner driven objective development. This increased the direct inputs from owners, and helped to ensure that owners and researchers agreed with the priorities and requirements within each community. Previous studies have found that intervention successes can be limited if owners and researchers have different perceptions on the key problems within a community (Upjohn *et al.*, 2013). Owners were included in developing an understanding of the problem during Chapters Four and Five, knowledge sharing during the intervention, and identifying and prioritising the problems they face and developing their own solutions to overcoming these problems. Owner inclusion can increase motivation and therefore improve the outcomes of an intervention (Haddy *et al.*, 2022). The group nature of the intervention also encouraged community cohesion which was highlighted as a potential facilitator during Chapter Five. The facilitator guide [Appendix X] was developed to increase ease of delivery for in-country researchers and improve replicability of the intervention.

Evaluation of interventions is vital to ensure objectives are being met and resources are being used effectively. This study aimed to evaluate the

outcomes of the intervention developed in this chapter. Through owner surveys and feedback groups intervention outcomes were successfully recorded at multiple levels of change. This study also gained feedback on the intervention from working equid owners and research staff members. There are a huge number of methods that can be used to assess whether an intervention has been successful (Abildgaard *et al.*, 2016, Nielsen and Randall, 2013, Nielsen and Abildgaard, 2013). During previous chapters of this thesis, a lack of psychological capabilities was identified. Many communities also expressed physical and social barriers to change, highlighting the need for interventions to be tailored to each individual community. By providing working equid owners with the knowledge needed to identify, manage and prevent equine colic, followed by owner led objective development, this intervention aimed to allow owners to use their newly developed knowledge to identify small changes that were feasible within their communities.

Evaluation of this intervention looked at different levels of change, starting from changes in knowledge and understanding, to intention to change, to evidence that behaviour change had occurred. The knowledge assessment surveys conducted before, immediately after and three months after the intervention showed an increase in the knowledge of colic signs and causes. Throughout owner focus groups recall and understanding of the signs, causes and treatment of equine colic was seen, further highlighting the improvement of knowledge amongst participants. Whilst knowledge improvement does not necessarily mean behaviour change, participants throughout these focus groups demonstrated an understanding and motivation to work towards change, with some participants giving evidence of small changes they had already made to their behaviour. The results from these focus groups and surveys suggest that this intervention improved owner knowledge of the signs and causes of colic and led to some examples of behaviour change amongst working equid owners. It is important to explore where the intervention was successful and where it requires further adaptations.

Qualitative questionnaires with the research team involved in the delivery of the educational intervention helped to map out what aspects of the intervention worked and what changes can be made to improve its effectiveness. The use of diagrammatic supporting materials with little to no required words was highlighted as an integral part of the intervention. The content was appropriate for the target audience and covered a relevant topic. However, the use of the objective development section was too complex to be used within this setting. Therefore, it is important to alter this and develop a less complex method for identifying and selecting small changes owners can make to improve the welfare of their equids.

#### 6.6.2 Limitations

Assessing intervention success can be challenging regardless of the environment (Noblet and LaMontagne, 2008, Murta *et al.*, 2007). However, this study in particular highlighted some additional challenges faced when working within low- and middle-income countries. The low level of literacy amongst participants increased the difficulty owners experienced whilst carrying out the survey. This led to intensified participant fatigue at an earlier stage in the research that may have been experienced by individuals with a higher literacy level. Participant fatigue can be a major problem in long surveys with participants becoming exhausted, bored or distracted as the survey goes on, which can reduce response quality during the later aspects of the survey (Ambler *et al.*, 2021). Whilst surveys of over 1-2 hours may be most likely to increase the risk of participant fatigue (Jeong *et al.*, 2023), one study concluded that an additional 15 minutes of survey time can be enough to have an impact on answer quality (Abay *et al.*, 2021). It is likely that cognitive burden contributes to participant fatigue (Jeong *et al.*, 2023). Whilst the survey used within this project was relatively short, with a maximum of 12 questions per round, it is important to consider the actual duration taken and the cognitive demands required. Feedback from the research team highlighted that participants had difficulty completing the first two rounds of the survey, with some owners spending up to an hour completing the first

round. This likely had an impact on the response quality within this survey itself. Participants were then required to participate in the educational intervention immediately after taking part in the first round of the survey. This educational intervention took between one and two hours to complete. Following this, participants were asked to complete the second round of the survey. The total duration from start to finish may have taken some owners up to three hours. When considering this, it is easy to see how participant fatigue may have impacted both the ability to actively engage for the full duration of the intervention, along with finishing the second round of the survey.

The requirement for owners to complete two surveys and the educational intervention in one visit was on account of owners living remotely, having limited contact with researchers, and many unable to attend multiple visits due to time and work commitments. An in-person approach to data collection and intervention delivery was the only realistic option and carrying out all aspects in one visit ensured data was collected from participants who attended the educational intervention.

Due to the feedback received emphasizing the challenges around the survey completion, it was decided to reduce the length of the survey further. Whilst the first two rounds contained minimal questions, a large number of questions were removed for the third round of the survey. Many of the removed questions were integrated into the owner feedback focus groups instead. This allowed participants to focus on a smaller number of questions that were best suited to a survey design.

There was a large participant dropout rate between the second and the third round of the survey, with only ten of the participants that completed round two returning to complete round 3. High attrition rates are often seen in longitudinal studies (Tambs *et al.*, 2009, Fischer *et al.*, 2001, Bjerkeset *et al.*, 2008, Gustavson *et al.*, 2012). With an attrition rate of 75% in this study, it was important to consider the reasons behind participant drop out. Drop out has been linked with low levels of education, age and those who are less

easily contactable (Young *et al.*, 2006), all of which may play a role in the dropout rate within this study. Discussions with staff members from CES and Fundación Arrieros Colombia highlighted that some owners will travel very long distances to attend the health brigades and participate in research. With the challenging topography and poor quality roads reported in Chapter Three, it is likely that it is extremely difficult for some owners to attend every health brigade/ research collection. Due to the high number of additional challenges associated with conducting longitudinal surveys within this context, it is likely that the attrition rate would be higher in comparison to longitudinal surveys conducted online in a high-income country. This may explain why so few participants were able to complete all three rounds of the survey. This is an important consideration for any future research within these communities.

### 6.6.3 Key findings

Ultimately the educational intervention aimed to reduce the risk and consequences of equine colic within working equid populations; however, assessing changes in colic rate would not be feasible as there is currently no system for recording disease incidence in these communities. Instead, the study focused on identifying the steps needed for a change in colic rates and then assessing changes to each of these steps.

The educational intervention was evaluated at several levels. Changes to owner knowledge of the signs, causes, prevention and treatment methods of equine colic were assessed. Intention and evidence of behaviour change was also documented, and general feedback on the content and delivery of the intervention was gained for participants and research members. This allowed the intervention to be triangulated and helped to highlight what aspects of the intervention were effective and what needs improvement.

#### 6.6.3.1 Changes to owner knowledge

Education can be used to expand an individual's psychological capabilities and reflective motivation (Michie *et al.*, 2011). Improving owner knowledge will increase the likelihood that an individual will elicit a desired change (Arlinghaus and Johnston, 2018). Owners were assessed on their knowledge

of the signs and causes of equine colic using a longitudinal survey. Focus groups with owners gained a further understanding of how owner knowledge had changed following the participation in the educational intervention.

Results from the survey highlighted that the educational intervention delivered in these communities resulted in an increased recall of colic signs and causes. The biggest improvement was seen between the first and second round of the survey with the median number of signs of colic identified increasing from three in the first round, to five in the second round. The median number of causes of colic increased from two in the first round to three in the second round. This increase suggests that owners were able to engage with the education given during the intervention and expanded their knowledge around equine colic.

Understanding the signs of equine colic can help owners to identify causes of colic earlier and provide basic treatment to their equids before these colic cases become more severe. In more developed countries, there is a focus by educational bodies and charities on early recognition and veterinary intervention of equine colic (Blue Cross, 2023, Scone Equine Hospital, American Association of Equine Practitioners, The British Horse Society, 2022a). Whilst veterinary intervention is often not possible within working equid communities, the administration of pain medication along with implementing safety protocols provides owners with a limited number of options to help manage cases of colic. The rate and severity of equine colic within working equid populations is still relatively unknown and relies massively on owner reports. Ensuring owners are able to successfully identify cases of colic in working equids provides a better opportunity to evaluate the morbidity and mortality relating to colic within these populations.

Prior to the educational intervention, many owners were only able to identify a few signs of colic, with rolling and lying down being the two most commonly reported signs of colic. More subtle signs of colic such as appearing dull and depressed, flank watching and kicking at the abdomen were only identified by 10%, 8% and 5% of owners respectively during the first round of the survey.



Whilst colic may often be associated with violent behavioural signs such as excessive rolling and restlessness (Scantlebury *et al.*, 2014, Bowden *et al.*, 2020a), many equids will not overtly show these signs (Cook and Hassel, 2014). This can lead to missing cases of colic or underestimating the severity of colic.

The ability to identify more subtle signs of illness become even more important when working with donkeys and mules. It is important that owners are able to understand the difference between these animals and horses. Donkeys are often referred to as 'hardy'; unfortunately, this term also results in donkeys being misunderstood (Geiger *et al.*, 2020). As prey species, donkeys can mask low- to moderate-grade chronic pain (Ashley *et al.*, 2005). Common signs seen in donkeys with gastrointestinal disease include appearing dull or depressed, lack of eating, recumbency, lowered head position, change in ear position, less responsive to stimuli and self-isolation (Thiemann and Sullivan, 2019). In acute cases of colic, donkeys may show some signs such as flank watching, kicking at the abdomen, lying down and rolling; however, these signs are often far less obvious than in horses (Thiemann and Sullivan, 2019). Mules sit between horses and donkeys showing more evidence of pain than donkeys, but less than horses (Thiemann and Sullivan, 2019). Donkeys, and in some cases mules, present with signs of gastrointestinal disease at a later point than horses (Thiemann and Sullivan, 2019). This highlights the importance of understanding and identifying the more subtle signs of colic, and recognising how these may vary between species.

Anecdotal reports suggest a higher number of donkeys within Kütünsuma, compared to other communities. Flank watching, passing fewer or no droppings and stretching were all identified by more participants in Kütünsuma compared to any other communities. Whilst this study had a small sample size with only ten owners from Kütünsuma, this may suggest that the owners who keep donkeys are more understanding of the differences seen and are able to identify colic when there are fewer obvious behavioural signs.

Further research involving larger numbers of participants would be required to validate this.

During the educational intervention ten main signs were discussed which were rolling, appearing dull and depressed/ lowered head position, lying down, kicking at abdomen, pawing at ground, reduced droppings, flank watching, sweating, not eating, and stretching. There are many other additional signs of equine colic that were not included in the intervention such as restlessness/ agitation, rapid breathing rate and circling. However, it was felt that providing owners with more than ten signs might be detrimental to their learning, with the quantity of the content becoming too much to feel manageable. Overall, there was an increase in the number of signs owners identified between round one and two and round one and three.

Of the reported signs of colic, eating less or nothing, pawing ground, kicking at stomach, and flank watching showed the greatest improvement between round one and two. These differences were also seen between the intervention and control group in the third round of the survey. The biggest difference was seen with reports of flank watching with 70% of the intervention group identifying flank watching as a sign of colic, whereas, this was only identified by 9% of the control group. The differences seen when comparing round one and two, and when comparing the two groups in round three further shows that owners were able to learn and retain information delivered during the educational intervention.

#### 6.6.3.2 [Intention to change](#)

Whilst participation in the educational intervention may have improved owner knowledge of equine colic, this does not equal behaviour change. Owners may now be aware of the ways to prevent colic, and how to identify and treat cases of colic; however, this does not mean this will be put into practice. Owners must have the motivation and intention of eliciting a behaviour change. The transtheoretical model of behaviour change states that there are six stages of change: precontemplation, contemplation, preparation, action, maintenance and termination (Prochaska and Velicer,

1997). In the precontemplation stage, individuals are often unaware of the consequences and impacts of behaviours, and have no intention of changing any behavioural habits. Owners who lack knowledge of the causes and risk factors of equine colic are unable to progress beyond the pre-contemplation stage as they are unaware of the outcomes of any related behaviour. Through education, owners are able to increase their knowledge and awareness of the potential outcomes of changing their behaviour and can begin to move into the contemplation stage. During the contemplation stage, individuals may start to analyse the benefits and drawbacks of eliciting a behaviour change. The next stage is preparation, where individuals will start to take small steps towards behaviour change. They understand why the change is needed and know what is needed to achieve it. Once individuals are prepared for change they move into the action stage where they have recently changed their behaviour and intend to continue. Following action, individuals move into maintenance and termination stages in which their behaviour change becomes fixed. Individuals can move between stages and exit and re-enter at any stage (Prochaska and Velicer, 1997). This model is frequently used within human health settings, for example during intervention development for stopping smoking and increasing exercise (Hashemzadeh *et al.*, 2019).

Thematic analysis of the owner feedback focus groups highlighted three overarching themes that can be reflected alongside this model. Changes in knowledge amongst participants were seen across focus groups and can demonstrate owners moving between precontemplation and contemplation. As owners gain an understanding of equine colic they appreciate that small changes can be made to reduce the risk of their equids experiencing colic. Exploring the consequences of equine colic to the equids along with their owners helps participants to weigh up the potential benefits of changing their behaviour. Only through this process of improvement of knowledge can owners begin to challenge their current behaviour and what changes are needed.

The second theme of 'intention and development of ideas for change' shows individuals moving into the preparation stage of this model. Owners had identified what changes were needed and why. They gained appreciation that changing their behaviour and management practices could improve the lives of their animals and in some cases themselves. Risk factors of colic were identified and owners were able to highlight which causes of colic were common within their communities, some stating this was rubbish consumption and others identifying feeding fermented food. Individuals knew that to reduce the risk of colic, they needed to work out how to avoid these risk factors, for example, how to stop their equids from accessing and consuming rubbish. Beyond this, owners recognised that they were capable of making everyday changes such as taking the rubbish out on a specific day or reducing the amount of panela or molasses mixed with their equids water, to reduce the risk factors their equids were exposed to.

The transtheoretical model of behaviour change does not largely consider the presence of barriers to change. However, within the working equid setting, these are vital to understand. The environment in which working equids and their owner live in is often challenging and there are a range of factors that may result in a behaviour being unable to be performed. Many of these equids live in warmer climates where access to water and feed options may be limited (Allan, 2021). With high temperatures experienced throughout the day, fermentation of food and water occurs more rapidly than in colder environments. Many owners are financially compromised, and expensive feed, equipment and medication are not feasible options (Burford, 2019). Utilities and rubbish collection may be insufficient. Owners may have little to no control over these factors and so are required to work around them. Without considering the environments of these individuals and their animals, it is impossible to ensure the suggested changes are feasible. By engaging owners in the development of change objectives, it was hoped that owners and researchers could discuss what changes could be made and how to work around any barriers. Whilst this likely increased the ability for owners to elicit

changes, one owner from Apartado stated that they *'would have wanted to change more, but it is still impossible and we ourselves have detected it. It is an issue that has to continue to change, from the cultural point of view'*. This owner highlighted the presence of a social barrier. For individuals to be able to continue to progress towards behaviour change, this cultural barrier must be addressed.

#### 6.6.3.3 Evidence of behaviour change

Whilst intention to change shows progression towards successful behaviour change, it is still not equivalent to actual behaviour change occurring.

Throughout the focus groups there was some evidence of owners changing their day-to-day behaviour. Examples of changes included reducing the volume of water with molasses given to equids, building a roof over the area where feed is kept to shade it from the sun, using left over feed as fertiliser rather than feeding it to their equid, and changing the equids water every day. These were small but significant changes owners were able to make to reduce the colic risk.

Owners also gave examples of colic cases they had seen over the past three months. These cases gave owners the opportunity to implement treatment methods that had been discussed during the educational intervention. There were three examples of equine colic reported by owners. All three owners reported that the equid was gently walked and that all three cases had survived. One participant discussed a case of colic that another owner's equid had experienced, during which they had advised the owner to gently walk the equid rather than letting it loose and in the end the equid had survived. This example not only shows the owner implementing what they learnt during the education, but also how knowledge is spread amongst individuals within the community. Social environments can have a dramatic impact on an individual's beliefs, knowledge and behaviour (Latkin and Knowlton, 2015, Nolan *et al.*, 2008). Understanding social networks and information spread can help us to identify intervention success beyond just the individuals who attended the intervention. Social networks could also act a barrier to an

individual eliciting a desired behaviour (Lightfoot *et al.*, 2023). Studies have shown that within a UK population, horse owner knowledge is often formed in a social context, such as on livery yards (Hockenhull *et al.*, 2010). The presence of social networks may reduce the likelihood of an individual contacting a veterinary professional, and instead seeking advice from others within their social network. This can have a potentially detrimental effect on the welfare of their animals. However, in working equid owning communities, veterinary intervention is often not an option and instead the presence of a social network could provide owners with increased knowledge and support.

#### 6.6.3.4 Feedback on content and delivery of educational intervention

Diagrams, illustrations and photographs are used worldwide to support teaching, advocacy and interventions, where they can play an important role in attention, understanding and memory (Norris, 2012). Diagrams and photographs are often used within teaching and education to support content and improve understanding (Shabiralyani *et al.*, 2015), and simple diagrams can help to help with information retention and recall (Norris, 2012). Imagery can be especially beneficial when working with populations with low levels of literacy (Park and Zuniga, 2016).

Diagrammatic handouts have been used in working equid interventions previously, and were found to be more effective than other forms of intervention (Stringer *et al.*, 2018, Stringer *et al.*, 2011). Positive feedback on the diagrammatic handouts was highlighted by both participants and research members. With the low levels of literacy among participants in this study, the use of diagrams and basic words helped to improve owner's understanding of the causes and signs of equine colic. The use of diagrams and images should be considered when developing interventions aimed at populations with varying levels of literacy to increase inclusivity.

#### 6.6.4 Future recommendations

It is vital that all feedback from the evaluation is taken into account. It was clear that the survey was detrimental to the educational intervention and therefore this should be removed or significantly altered if possible. If further

data analysis is required this would not be an appropriate method for collection. In addition to this, it was reported that participants struggled to understand the concept of the community objective development. Therefore, this area needs improvement. Motivational interviewing (MI) can be used to increase personal motivation towards a specific goal (Miller and Rollnick, 2012). MI can empower individuals to change their behaviour by identifying their own reasoning and capacity of change (Shinitzky and Kub, 2001). This could be extremely beneficial within working equid owning communities as it increases owner power over change and ensures changes will be feasible, along with increasing the likelihood of change occurring due to increased internal motivation. Once these changes are made, owner involvement should improve and further outcome success should be seen.

The significance of equine colic within working equid populations in Colombia has been highlighted, and therefore; the educational intervention should be delivered to further communities. This should not only include working equid populations across Colombia, but also those across other countries. Owner participation to identify focus areas, barriers and ways to elicit change, the educational intervention can be used across a number of contexts. Continued evaluation of the educational intervention as it is delivered across other populations should be carried out, to ensure that any context related problems are identified and altered where appropriate.

This educational intervention can be easily modified to target other risk factors of equine colic, such as workload or worming depending on the priorities of each community. Beyond colic, the process used within this intervention can also be adapted to be used for a range of other health conditions by simply identifying risk factors associated with other health concerns. This could improve working equid owner knowledge substantially, and encourage a number of small changes to improve management practices. This would ultimately benefit the lives of their animals and consequently owners and their families.

## 6.7 Conclusion

The use of educational interventions using interactive activities and diagrammatic supporting materials has the potential to improve working equid owner knowledge. Important considerations for developing interventions include literacy rates amongst the target audience, and attention spans. Working equid owners may have low levels of literacy and reading and writing may result in fatigue faster than in other populations. The inclusion of a survey before and after the intervention resulted in higher rates of participant fatigue and resulting in participants struggling to actively engage for the duration of the intervention. The most important aspects of an intervention must be prioritised to ensure participants are able to engage appropriately.

Developing personal goals and objectives empowers owners and encouraged them to change their behaviour and management practices to improve the welfare of their equids. Simple changes to an owner's day to day management of their equids has the potential to reduce the risk of colic in working equid populations and can consequently improve the lives of their equids and the owners themselves.



## 7 Final discussion

### 7.1 Overview

This project identified key problems within working equid communities in Colombia and developed an intervention to improve working equid welfare and consequently owner livelihoods. Throughout this thesis the relationship between owners and working equids has been highlighted.

Following the Covid-19 pandemic, the first step of this thesis was to identify any impact that the pandemic had on working equid owning communities. With major global consequences, it was expected that there would be some level of effect upon these communities. Chapter Two highlighted the economic consequences of the pandemic on working equid owners across the world. With many working equid owners living in poverty prior to the pandemic it was concerning that these owners reported further financial challenges, and being pushed deeper into poverty. Whilst the economic situation was exacerbated, there was limited change to the care and welfare of working equids. This identified that the welfare of these animals was likely similar to reports prior to the pandemic, and set the health and welfare baseline for the subsequent studies.

Chapter Three explored working equid owning communities across Colombia, mapping out the social and physical environment, owner perceptions and knowledge, and current equid care and welfare. This allowed a detailed picture of these communities to be built which was essential to then create interventional strategies. This chapter highlighted the importance of a One Welfare approach and the significance of the relationship between equid, owner and the environment. The COM-B model of behaviour change was used in this chapter to explore how owner behaviour and decision making occurred, and how this impacted working equid welfare. Specific welfare concerns within these communities were identified, which included reports of equine colic and the impact it had on equine health and survival.

The next phase of work planned an intervention for a specific disease, and based on the outcomes of Chapter Three, it was decided to focus on colic. During Chapter Four, a baseline survey was carried out through an in-person survey in selected communities. This confirmed the significance of colic within these working equid populations. High frequency and mortality rates of equine colic were reported by owners, but owners also showed a lack of knowledge of the signs, causes and treatment of colic, highlighting issues around recognition, prevention and management. Most communities had very limited or inappropriate treatment options and a complete lack of techniques for euthanasia, which together magnified the welfare impact. This study highlighted how prevention of colic within these populations is vital, as most communities had limited or no access to effective treatments. Prevention therefore becomes even more critical to reduce the frequency and mortality, along with the consequences of inappropriate treatment methods and prolonged suffering due to a lack of euthanasia.

Chapter Five involved focus groups and participatory workshops conducted in each community to explore methods of prevention of colic and owner perception and knowledge of colic. Again, severe welfare consequences of colic were identified as well as the economic consequences of colic. Multiple aspects of equid care were highlighted as potential areas where simple changes could reduce the risk of colic. Nutrition and water management were the biggest risk factor identified in all communities that were involved. Basic aspects of management were recognised as potential solutions, including removal of fermented food, increased water provision and reducing equids access to rubbish. However, findings from this chapter along with Chapter Three, highlighted how the social and physical environment may act as a barrier to changing management practices. The potential barriers were explored in depth during this chapter and several important considerations were identified, including financial constraints and access to veterinary care. Potential facilitators including community cohesion and motivation to learn

were identified with the intention to use these during the intervention to encourage owner behaviour change.

Chapter Six developed and evaluated an educational intervention to reduce the risk of equine colic within working equid communities in Colombia. Results from previous chapters in this thesis, along with frequent in depth discussions with staff from in country research teams from Universidad de CES and Fundación Arrieros Colombia, and staff members from World Horse Welfare and Nottingham University informed this development. The educational intervention was composed of five sections: an overview of colic, an activity around recognising colic signs, an activity around nutrition, objective development, and treatment information. An initial overview, covering key concepts relating to colic was delivered to participants prior to practical activities. The colic signs and nutrition activities were interactive and required owners to work in small groups to discuss the signs of colic and nutritional management practices that impacted risk of equine colic. The objective development section encouraged owners to select one or two small changes they would be able to implement that would help to prevent equine colic. Owners were then given a brief explanation of the treatment for equine colic. Along with the interactive session, owners were provided with a leaflet reflecting the content from all five sections of material they were taught during the educational intervention. This educational intervention was delivered to four communities across Colombia.

The educational intervention was then evaluated through a longitudinal knowledge-based survey, owner feedback focus groups, and research staff qualitative questionnaires. Owner knowledge of the signs and causes of colic was improved after participating in the educational intervention. Knowledge is one of the contributing factors to human behaviour change, and so illustrates a step towards owners achieving desired changes. Results from owner feedback focus groups highlighted that three months after the educational intervention, owners were able to recall and understand the content of the intervention. Owners were aware of management changes

they needed to make, and there was some evidence of owners who had successfully implemented their objectives for change. The outcomes of the interventions varied; however, it was clear that participation in the intervention had encouraged owners to think about their management decisions and identify areas where changing their behaviour could prevent or improve the management of colic within their equids.

This thesis covers the initial steps in the development and implementation of a successful intervention to improve working equid welfare and owner livelihoods. It is vital that continued dissemination and evaluation of this intervention are conducted across additional communities and countries.

## 7.2 Overall study design and limitations

### 7.2.1 Use of mixed methods

This project used a mixed-methods approach, using a combination of qualitative and quantitative research methods. Quantitative approaches are often used to gain reliable factual data that can be generalised to wider communities (Steckler *et al.*, 1992). Quantitative surveys were important throughout this research to gain a mixture of information. Data in Chapter Two was collected from a range of working equid communities, from 14 countries around the impact of Covid-19. For this part of the project, the use of surveys allowed data to be collected quickly from a large range of contexts, and as a result the findings from this study are more generalisable to other working equid owning communities across the world. During Chapter Four, a baseline colic survey was conducted to gather information from a larger number of participants across the selected communities. There were challenges associated with the use of surveys within working equid owning communities, as discussed within Chapter Six.

The majority of this project used qualitative data collection techniques including focus groups, workshops and qualitative questionnaires. These methods allowed an in depth understanding within each community to be developed. Focus groups are a vital tool in qualitative research, with participants often providing greater detail of events and perceptions through discussion within a group setting (Wilkinson, 1998). The stimulation of conversation around equine colic was key to this project, and with little prior knowledge of colic within these communities focus groups provided an environment where a large amount of detailed information on this topic could be collected (Clarke and Braun, 2013). The use of focus groups in low- and middle-income countries requires additional considerations (Scheelbeek *et al.*, 2020, Jakobsen, 2012, Hennink, 2007). Additional considerations include steep power gradients between researchers and participants and varying conversational norms, which can lead to participants feeling less confident with voicing disagreements or providing personal details (Jakobsen,

2012). This influenced the decision to use focus groups rather than individual interviews. Data collection throughout this project was carried out by in-country researchers with community experience who had a better understanding of conversational norms. These researchers were involved with each step throughout the project and additionally worked alongside the owners to provide veterinary care and treatment periodically. The consistency of interactions between researchers and owners helped to build a better relationship, and increased trust which encouraged active engagement amongst participants (LeBaron *et al.*, 2015). The use of interactive activities throughout data collection and educational intervention delivery, increased participant-participant interactions. This ultimately provides richer data to be collected with participants likely to discuss topics in further detail. During qualitative research, including in focus groups, it is often the goal for participants to interact and discuss between themselves (Jakobsen, 2012). Focus groups can increase the stimulation of ideas between participants so are beneficial where there is little pre-existing knowledge (Clarke and Braun, 2013). These characteristics of focus groups resulted in the decision to use focus groups rather than individual interviews throughout the project.

An important consideration for the first round of focus groups carried out in Chapter Three, was to conduct a female only focus group within each community. Gender inequalities have been reported in a number of settings within Colombia (Greenspun, 2019, Iregui-Bohórquez *et al.*, 2019, Alzate *et al.*, 2024). Whilst the gender roles and perceptions were largely unknown within the communities being researched prior to the study, it was assumed that social norms meant that mixed gender focus groups would have limited female contributions due to power dynamics between participants. When discussing working equid welfare, female perceptions were extremely important. Women play a significant role in the lives of working equids, yet many feel they lack the access to equid specific support (Upjohn and Valette, 2014) and therefore the use of female only focus groups provided women with a safe environment to discuss their knowledge and perceptions

associated with working equid care. Following Chapter Three, it was decided that mixed focus groups would be sufficient within the communities; however, this was still an important consideration and the use of mixed focus groups may have reduced female contributions. In order to reduce the impact of using mixed focus groups facilitators encouraged the participation of all participants throughout the rest of the project.

### 7.2.2 Translation and language differences

Language translation is often a concern within cross-country research, particularly when using qualitative methods (Al-Amer *et al.*, 2016, Temple and Young, 2004). This project relied on Spanish speaking in-country researchers to conduct data collection, and an in-country translator to transcribe and translate all transcripts. The process of translation can change and remove some of the meaning behind what participants have expressed (Esposito, 2001). There are multiple considerations associated with translations throughout this research project. The first is the communication between the primary researcher (JB) and the in-country researchers (SH, CJ, SP). In-country researchers had a range of English-speaking ability and communication was carried out in English. Prior to each aspect of data collection, the process, content and aims of the project were discussed with time allocated for any questions to be asked. This was done to reduce the likelihood of misunderstanding the questions or content to be delivered. However, there is still potential that misunderstanding occurred and as a result the data collection was not always carried out as initially anticipated. All focus groups and workshops were audio recorded, and were transcribed and translated by a Colombian translator. The translation process can impact the interpretation of the data (Temple, 1997) and should be taken into account. An in-country translator was selected as most appropriate to increase the understanding of the local languages and nuances. The methods used during transcription determine how much detail is included, for example, the punctuation, and whether the use of tones was included. Additional noises, redundant words and non-verbal content was excluded during transcription throughout this

project. Following the translation and transcription, the interpretation of the data by the primary researcher may be different to both what was meant by the translator and the participants. Whilst overall meaning and significant themes are likely to remain consistent throughout the process, it is possible that some information was lost or misunderstood at various points during the project.

Qualitative research within these types of communities is challenging. A number of mitigations were put in place to minimise this . The collaboration and enthusiasm, and existing networks with Universidad de CES and Fundación Arrieros Colombia were essential to the success of this project.



## 7.3 Key findings

### 7.3.1 Understanding context prior to intervention development

There are a huge number of interventions that have been developed and implemented to target working equid welfare across the world. The efficacy of such interventions varies and there are a number of barriers present within working equid owning communities that can impact the outcome of interventions and support (Haddy *et al.*, 2022). Haddy *et al.* (2022) conducted 32 semi-structured interviews with NGO staff across eight international and national organisations. The current approaches to improving working equid welfare varied and the need to tailor the approach to the specific context that it would be used in were highlighted. Therefore, throughout this thesis it was vital that the intervention that would be implemented was appropriately developed and evaluated.

Frameworks and models can be used during intervention development to help elicit human behaviour change, which has been seen in human health settings for years (Jepson *et al.*, 2010) and is increasing in use when considering animal welfare (Glanville *et al.*, 2020).

Glanville *et al.* (2020) reviewed 47 studies involving an intervention associated with behaviour change in an animal welfare setting. There were a large number of studies that explored current behaviour but few that went on to develop and implement associated interventions. This review suggests a need for studies to move beyond exploration of current behaviour to actually implementing behaviour change interventions in order to improve the welfare of animals. This is extremely important when considering the welfare of working equids and the nature of NGO's. Within contexts such as these evaluation of the impact of an intervention is vital. Research also needs to support and improve the lives of the vulnerable communities that are involved.

Many interventions are designed with little to no supporting evidence and are based on limited available literature and personal assumptions (Hughes *et al.*,

2016). This approach is often unsuccessful as it fails to fully assess the behavioural target or analyse what is actually needed to achieve change (Hughes et al., 2016). Instead, using theories and frameworks ensures an in depth review is carried out prior to intervention development. This increases the likelihood of intervention success by mapping out the specifics of the desired behaviour change, identifying potential barriers that may be encountered, and ensuring the delivery method is appropriate and inclusive of the target audience (Hardeman et al., 2005, Fisher and Fisher, 2000, Michie and Prestwich, 2010).

Intervention mapping (Fernandez *et al.*, 2019) was used throughout this thesis to guide the development, implementation and evaluation of the educational intervention. There are six steps described in intervention mapping:

1. Development of a needs assessment
  - Establishing a detailed understanding of the problem, population, behavioural and environmental causes, and availability of resources
2. Development of outcomes and objectives
  - Describing the behavioural and environmental outcomes, develop objectives for change in the behavioural and environmental causes, and confirm the targets for the intervention.
3. Program design
  - Identify the theory and evidence-based behaviour change methods and alter these to fit the practical application of the intervention
4. Program production
  - Combine each component into a coherent programme that is appropriate for the context
5. Program implementation plan

- Development of implementation strategies to facilitate the delivery and maintenance of the intervention

#### 6. Evaluation plan

- Plan both process and outcome evaluations to assess the efficacy and effectiveness of the intervention

Each chapter within this thesis follows the stages of Intervention Mapping. Chapter Two, Three, Four and Five were conducted prior to the development of the educational intervention. These chapters aimed to provide a detailed understanding of the problem, population, behavioural and environmental influencing factors, and available resources in line with stage one of the intervention mapping framework (Fernandez *et al.*, 2019). With little existing research exploring the lives of working equids and their owners, there is even more emphasis on the need for this understanding to be developed prior to intervention development. Chapter Two explored larger populations across a range of countries and communities. Chapters Three, Four and Five then focused more closely on specific problems within specific communities. This allowed the problems and target audience to be prioritised and ensured that the educational intervention would be appropriate for the context in which it would be delivered. Beyond the specific findings discussed in each of the relevant chapters, there were additional considerations that were identified throughout the research process across all studies. This included the considerations of working cross culturally, and community specific challenges.

##### 7.3.1.1 Considerations for cross cultural research

It is not uncommon for working equid support and intervention development to be carried out cross-culturally which can result in challenges around communication and effectiveness of interventions (Rogers *et al.*, 2023). The term culture is used to describe social behaviour and norms, and includes knowledge, beliefs, capabilities and habits (Birukou *et al.*, 2013). An understanding of the language and cultural background along with strong interaction skills are needed for successful cross-cultural communication (Saville-Troike, 2008). Whilst the term culture is often associated with

geographic location and nationality, individuals may feel culture refers more accurately to socioeconomic background, education, language, religion and specific areas of habitation (Rogers *et al.*, 2023). Throughout this study, working equid communities from close geographical regions often exhibited very different cultural and social norms, highlighting the variation even within communities in close proximity. During Chapter Three, Santa Marta-Kütünsuma and Santa Marta- Machete Pelao were grouped together and analysed as one region as the two communities were extremely geographically close; however, following the findings from the study, it was decided to separate these two communities during data collection and analysis. Whilst the two communities lived directly alongside each other, the cultural and social environments altered so dramatically that it would not be appropriate to group the two of them together. Understanding working equid communities more deeply enables differences such as this to be identified, which is a key factor when considering the support each community needs. In Santa Marta, the two communities would need different approaches in regard to support provision. In Kütünsuma, it was vital to consider the deeply engrained traditional views and norms within this indigenous community. By contrast, in Machete Pelao, the social environment encouraged rough handling of working equids and there were close links between this and the high levels of intrafamily abuse. These two communities would need completely different approaches when encouraging behaviour change to improve animal welfare. Throughout this thesis, it was important to include a variety of cultures and communities to ensure the educational intervention developed would be flexible enough to be translatable to a number of different environments, including other countries.

#### Variation in perspectives

An important aspect of working cross-culturally is the ability to take into account the perspective of others (Rogers *et al.*, 2023). Rogers *et al.* (2023) conducted semi-structured interviews with 14 participants working across 29 countries to investigate experiences when working cross-culturally in an

equine welfare setting. Regarding animal welfare, a number of themes were identified through thematic analysis, including 'limited financial and material resources', 'limited understanding of animal welfare', and 'attachment to traditional medicines and practices'. Additionally, considering cultural sensitivity, two themes were identified: 'the importance of trust and respect', and 'working with local partners'. Identifying and sharing the experiences of working cross-culturally is vital to developing suggestions for improving this kind of research and support provision. The findings from studies such as this should be used to provide practical solutions to cross-cultural work. As part of this study, Rogers *et al.* (2023) explored the perceptions of the term 'welfare'. Through discussions with NGO staff it was clear that the term 'welfare' was often associated with health, vaccines and dewormers, rather than the social and emotional state of the animal or the level of pain the animal was experiencing. Authors concluded that the ability of researchers to separate their own level of emotion and perception of welfare, and instead understand the situation from the perspective of the owners they are working with is incredibly beneficial.

### Reflexivity

The differences in perspectives between owners and researchers can impact the research process (Olmos-Vega *et al.*, 2023). Throughout this project, reflexivity of researchers was required, to explore how subjectivity and context may have influenced the research process. Reflexivity statements from the primary researcher (JB) and in-country researchers (SH, CJ, SP) are included in the appendices. Due to the nature of qualitative research, reflexivity is needed to evaluate the interconnections between subjective bias and the research processes (Finlay, 2002). As this project involved a number of communities with a variety of cultural and social norms, intentional or unintentional preconceptions could risk misinterpretation of the data and avoid a true understanding of each community from being formed. It was vital that this was taken into consideration throughout the project, and any potential preconceptions were avoided.

### Traditional practices

The consideration of traditional medicine and practices is important in working equid research and intervention development (Rogers *et al.*, 2023). Traditional practices are often passed down generationally, and are heavily ingrained in working equid owning communities, some of which may be detrimental to the welfare of the equid. International NGO staff have highlighted the importance of avoiding pre-conceived ideas of working equid communities, with a key part of providing support to these communities being truly understanding the social, cultural and economic context from the perspective of the owners (Rogers *et al.*, 2023). Respecting the traditional methods used in working equid owning communities encourages owners to trust researchers which in the long-term will motivate owners to take on advice from NGO staff. There were a large number of owner reported use of traditional medicine and practices across communities, including the common use of beer and urine as a treatment for equine colic. These treatments were frequently used, with some owners reporting cases where colic had resolved after the use of these treatments.

The use of traditional treatment methods has been seen in other working equid populations across the world (Wild *et al.*, 2021a, Nye *et al.*, 2021). Wild *et al.* (2021a) carried out semi-structured verbal questionnaires with 93 working equid owners across 11 communities in Honduras and found that the most common treatment method for equine colic was herbal treatment including natural laxatives. Nye *et al.* (2021) used a mixed method approach including a livelihood survey and semi-structured focus groups with 37 working equid owners in Nepal and concluded that traditional treatment methods were frequently used amongst participants. Whilst both of these studies are conducted in single countries with a limited number of communities, and the specific treatment methods varied, they all highlighted the use of traditional medicines and practices within a working equid setting.

Traditional medicine and community knowledge are a key component of many individual's day to day lives and management practices (Ghotge *et al.*, 2002). Whilst many traditional methods lack evidence to support or oppose their use, a small number of studies have validated some of these methods, including those involving the use of various types of plants in the treatment of various health problems in a mixture of farm animals (Ghotge *et al.*, 2002). Whilst there is still a lack of evidence to support these methods, there is also a lack of evidence to suggest that they are ineffective.

Beyond the use of traditional medicine within an equid setting, there are a huge number of reports of the use of these methods within human health. The World Health Organisation recognise the potential contributions of some traditional healthcare methods, and encourages the safe use of such practices (World Health Organization, 2013). Engaging and involving traditional medicine encourages positive relationships with communities. Individuals often experience conflicts between traditional and modern medicine, which can cause additional stress and anxiety (Santamaria *et al.*, 2018). Collaborative research over eight years investigating traditional medicine in Arhuaco indigenous communities in Santa Marta, Colombia, highlighted the wider cultural and spiritual components that are involved in these traditional methods (Santamaria *et al.*, 2018). The complexity of these traditional and cultural practices, highlights how detrimental the discouragement or disengagement with these practices may be. When developing interventions aimed at human or animal health, the identification and inclusion of traditional practices is vital to ensure the appreciation of culture within the community.

Whilst it is possible to encourage the use of evidence-based medicine in a human or animal health setting, these suggested methods must be feasible. Many owners throughout this study would have been unable to provide alternative evidence-based treatment methods for colic, and instead used traditional methods that had been generationally passed down based on

easily accessible materials and products. With little to no alternatives, it would not be effective to focus on evidence-based treatment methods only. Instead, the educational intervention focused on prevention of colic, and in terms of treatment, aimed to reduce the potential detrimental effects of certain traditional methods.

#### 7.3.1.2 Community specific challenges

The term 'working equid' is often used as an umbrella term and covers all of these animals working across the globe. However, the findings from working equid studies are not always generalisable to all working equid populations. Working equids in brick kilns in Nepal live entirely different lives to donkeys used for transport in sub-Saharan Africa, and again to mules working on farms in tropical climates in South and Central America. Everything from the workload, climate, type of animal, equipment used, type of work, and management practices to the owner expectations, income requirements, cultural norms and opportunities available is extremely different in each working equid owning environment.

Significant regional differences have been seen in general welfare and management practices within working equid populations across the world (Haddy *et al.*, 2021b, Burn *et al.*, 2010a, Merridale-Punter *et al.*, 2022). Haddy *et al.* (2021b) compared the welfare of working equids across three communities in Mexico and found that the welfare varied depending on species, work type, sex and location. The author attributed the significant variation to differences in physical environment, climate and cultural and social norms; however, the external environment of each community were not explored in detail. The study used the Equid Assessment Research and Scoping (EARS) tool to ensure the results were standardised between different communities. The findings from Haddy *et al.* (2021b) support findings from this thesis highlighting the importance of understanding the context of each population. Chapter Three of this thesis explored the social and physical environment, owner behaviour and equid welfare across a number of communities in Colombia. It highlighted just how different each



working equid owning community can be. Whilst there were some components that were seen across communities, the majority differed to some extent.

Along with the differences seen between communities, it was clear that the social and cultural environment of many working equid owners is dramatically different to that of the UK and other developed countries. This highlighted just how important it would be to ensure data collection and intervention delivery was flexible.

Kütünsuma is an indigenous community in the Sierra Nevada de Santa Marta on the Caribbean coast of Colombia. The environment of this specific community is dissimilar from all other communities throughout this project. Kütünsuma is based in the region inhabited by one of the four indigenous communities living in the northern region of Colombia, individuals here are known as 'Arhuacos' and all speak a native language referred to as 'Arhuaco', 'Ika' or 'Bintukwa', with some also speaking Spanish. Individuals in this community grow crops to live off and some have a small income from tourism. Children's formal teaching stops at 11, and much of their education is based around spirituality. Individuals living in Kütünsuma believe in a strong connection with nature, and emphasise their confidence that nature will support them if they take care of it (Santamaria *et al.*, 2018). The family and societal structures are extremely different. Individuals live as a large community with cultural figures including "Mamos" acting as strong leadership figures. There are two types of authorities within the Arhuaco community, the spiritual authority known as Mamos, whose role is based around the preservation of traditional knowledge, and political councils. Mamos act as traditional healers and spiritual leaders within the community. These individuals are involved in decision making regarding political, social and cultural situations where their decision is often based on their belief systems and association with nature (Suárez-Krabbe, 2012). In addition to the spiritual authority of mamos, these indigenous communities have their own political authorities. Their role involves decision making during conflicts within

their communities; however, these individuals do not have the same power or respect within the community as the Mamos (Medina and Quintana, 2023).

Within this community, permission was needed from the Mamo for data collection to occur. In terms of consent for research purposes, permission was needed from the Mamo for all individuals. Any participants that were over 18-year-olds were able to give additional consent in line with UK ethics standards. In cases where participants were under 18, parental consent was not an appropriate option due to societal and cultural norms and expectations.

Other research conducted with indigenous Arhuaco communities sourced consent from Arhuaco authorities including the Mamo (Pinto-Marroquin *et al.*, 2022). The challenges around consent in an indigenous setting have been highlighted across the world. Peltier *et al.* (2024) conducted a scoping review of 11 studies to explore culturally safe content processes that ensure that respect is maintained within an indigenous setting. This review focused on consent of under 18-year-olds. The authors identified three key recommendations: addressing tensions in the ethics of consent, embracing wise practices, and using relational approaches to consent. Included in this review, Fletcher *et al.* (2012) and Baydala *et al.* (2011) expressed the high value indigenous communities place on collective decision-making, elder involvement, and community impact. Fletcher *et al.* (2012) suggested the use of community leader or elder approval ensures cultural protection, with the use of western process risking cultural safety within this context.

In addition to ethics within this thesis being approved by the Committee for Animal Research and Ethics, School of Veterinary Medicine and Science, there was additional review by Universidad de CES ethics committee. Universidad de CES ethics committee have a deeper understanding of and experience with working with indigenous communities, and a greater knowledge of the cultural and social values within these communities. The legal framework and concepts of UK ethics are not necessarily translational to the indigenous communities included in this research, and as a result it was

decided to defer to Universidad de CES ethics committee in line with Colombian ethics standards. Through a deep understanding of the indigenous community, CES were aware of the role of the Mamo. The role of the Mamo as a parental guardian for juveniles is deeply engrained in the culture and society of the indigenous communities and consent was given by the Mamo for any individuals under 18-years, rather than the parents. In these communities the Mamo takes over the guardianship of minors, including in aspects such as the allocation of adult mentors who are responsible for social development often including sexual education. Despite the age disparity, once children reach an adult age they may choose to remain coupled with their mentors or leave to pursue different relationships.

### 7.3.2 Developing and evaluating educational interventions

Throughout this thesis, behaviour change and intervention models were used to guide some of the analysis and the development of the educational intervention. Human behaviour is extremely complex and models can be used to build a better understanding of the components that are involved in behaviour (Davis *et al.*, 2015). Depending on the context, certain models may be more beneficial or relevant. In Chapter Three of this thesis, the COM-B model of behaviour change was explored, this was beneficial within the context of working equid owner behaviour and decision making. With many working equid owners living in poverty, and or in extremely rural communities, there are a number of external factors that act as barriers. The COM-B model regards external factors highly (Michie *et al.*, 2011).

Through the involvement of the COM-B model it was possible to identify what components needed targeting for change to occur. Whilst it was clear that the social and physical environment within these communities resulted in a lack of opportunities for owners, the psychological capabilities of owners were also insufficient. Through the use of intervention development models such as the behaviour change wheel it is possible to support the use of education as an intervention function appropriate within this context.

Educational interventions are used to target an individual's psychological capabilities and reflective motivation (Michie *et al.*, 2011). Whilst this will impact on an individual's ability to elicit a desired behaviour change, there are a huge number of additional components that influence behaviour (Michie *et al.*, 2019). By targeting more than one component that contribute to human behaviour, interventions will be able to increase the likelihood of successful change occurring. Intervention functions include persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling and enablement (Michie *et al.*, 2011). Through education, it is possible to encourage owner behaviour change to the extent that is feasible within the specific context; however, education alone is not enough to elicit all the changes needed to prevent and improve the management of equine colic within working equid communities.

## 7.4 Future recommendations

This thesis produced an educational intervention to encourage owner behaviour change with regards to working equid welfare. There are a number of steps that should now be taken to expand the impact this educational intervention can have on wider working equid populations.

1. Alterations to current educational intervention
2. Increased research into working equid owner behaviour and decision making
3. Expand content and reach of educational intervention

### 7.4.1 Alterations to current educational intervention

Chapter Six of this thesis included an evaluation of the educational intervention. The findings from this study highlighted several changes that need to be made in order to improve intervention success. These changes are:

- Removal of the evaluation survey before and after the educational intervention delivery as this resulted in high levels of participant fatigue and negatively impacted owner participation in the education intervention. Evaluation of the educational intervention is still a vital step; however, this should be done using feedback focus groups, interviews or verbal questionnaires at separate community visits.
- Modification of the objective development section: owners found this overly complicated. It is important to encourage owners to decide on their own objectives for change; this could be done using motivational interviewing. In-depth training for researchers/ NGO staff would be needed to ensure that this is effective.
- Changes to leaflet: change shape so easier to fold, remove spaces for owners to write/ draw and replace with diagrams to increase inclusivity for those with a lower literacy level.

It is vital that the educational intervention is further evaluated with feedback collected from working equid owners and research/ NGO staff to ensure that changes are made where appropriate. Due to the variation seen within working equid owning communities it is expected that alterations will need to be made throughout the delivery process.

#### 7.4.2 Increased research into working equid owner behaviour and decision making

Throughout this thesis it was clear that working equid owner behaviour and decision making had a significant impact on the welfare of working equids. This along with the social and physical environment of working equid owning communities it is vital to understanding the problems faced by working equids and their owners and reasons behind them. The importance of including both the horse-human relationship (Luna and Tadich, 2019) and the social and physical environment (Haddy, 2022) in working equid research has been seen previously, yet there is still a major lack of research exploring this. Further research should be conducted across additional communities across Colombia, as well as other countries across the world. This will build a better understanding of these communities and how support can be better provided.

#### 7.4.3 Expand content and reach of educational intervention

This educational intervention aimed to reduce the risk of equine colic through management changes. There was a particular focus on colic risk factors associated with nutrition and water management. However, this educational intervention could be easily adapted to cover other risk factors of colic, or to target various other health problems. The same process (as outlined below) should be used, with the content altered depending on the desired outcomes. The process described should be conducted with each working equid owning community to ensure the educational intervention is appropriate for the context it will be delivered in.

Education intervention process:

1. Community needs assessment: Chapter Five of this thesis explains the appropriate methodology to explore the significant problems and associated risk factors in each community.
2. Alteration of content included in educational intervention: Depending on the findings from the community needs assessment, this may require changes to supporting resources such as educational infographics.
3. Use of facilitator guide to deliver educational intervention.

Developing trust with working equid communities is key and relationships with working equid owners should be maintained through continued visits. Maintaining positive relationships with these communities will increase the likelihood of successful outcomes. Following the community needs assessment, it is possible to deliver the educational intervention for a number of health problems and associated risk factors over time.

This educational intervention should be rolled out across a wider range of working equid communities across Colombia as well as other countries across the world. Through the process described above, the educational intervention should be easily tailored to each community.

## 8 Overarching conclusions

The relationship between working equids and their owners is incredibly important. The welfare of these equids and the livelihoods of their owners depends upon this relationship, and it is vital to consider this when developing support and interventions. There are a number of external environmental factors that owners and equids must navigate on a daily basis, and in some cases these factors can act as significant barriers to equid care and management.

Working equid owner behaviour and decision making was explored using the COM-B model as an underlying framework. This allowed the bigger picture of working equid owning communities in Colombia to be explored. The exploration of all aspects of these communities is vital to ensure that support and interventions are appropriately tailored to the context in which they will be delivered. Human behaviour change provides a way to improve working equid welfare through an owner driven approach.

Working equine welfare is often compromised, with equine colic highlighted as a particular problem in working equid populations in Colombia. The high mortality and assumed prevalence rates identified, along with a lack of treatment options and euthanasia exacerbate the associated welfare and economic consequences.

Through the development of an educational intervention aimed to reduce the risk of colic, it was possible to identify small daily changes that owners were able to make to reduce the risk of colic within their equids. This educational intervention increased owner knowledge of the signs and causes of colic. Owners were able to identify areas of their own management practices that needed to be changed and started to make steps towards doing so. Some owners successfully elicited changes such as removing fermented feed and storing food and water out of the sun. All of these will help to reduce the number of colic risk factors their equids are exposed to.



The consideration of external factors beyond the owners control was key in ensuring suggested changes would be feasible. Each community varied in their social and physical environment, and equid care and management. It was therefore essential to ensure flexibility in intervention development and implementation.

The educational intervention designed in this thesis can be rolled out across a number of working equid owning communities easily. This educational intervention can also be easily modified to target a range of owner behaviours, risk factors for colic, and to focus on other welfare problems within working equid populations. The findings from this thesis have shown that this education intervention has positively impacted working equid communities; and through further dissemination it has the potential to benefit a large number of working equids and the communities in which they live and work.

## References

- ABAY, K. A., BERHANE, G., HODDINOTT, J. & TAFERE, K. 2021. *Assessing Response Fatigue in Phone Surveys* [Online]. Available: <https://doi.org/10.1596/1813-9450-9636> [Accessed 12 April 2024].
- ABBAS, N. S. 2014. Voices from women [Conference poster]. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st 3rd July, 25-26.*
- ABILDGAARD, J. S., SAKSVIK, P. & NIELSEN, K. 2016. How to Measure the Intervention Process? An Assessment of Qualitative and Quantitative Approaches to Data Collection in the Process Evaluation of Organizational Interventions. *Frontiers in Psychology*, 7, 1380.
- ABRAHAM, C. & DENFORD, S. 2020. *Design, implementation, and evaluation of behavior change interventions: A ten-task guide*, Cambridge University Press
- ADAMS, E. A., STOLER, J. & ADAMS, Y. 2020. Water insecurity and urban poverty in the Global South: Implications for health and human biology. *American Journal of Human Biology*, 32, e23368.
- ADAMS, S. 2022. *Lameness in Horses* [Online]. Available: <https://www.msdtvetmanual.com/horse-owners/bone,-joint,-and-muscle-disorders-in-horses/lameness-in-horses#:~:text=A%20horse%20is%20said%20to,cause%20of%20lameness%20in%20horses.> [Accessed 05 January 2024].
- ADMASU, B. & SHIFERAW, Y. 2011. *Donkeys, horses and mules- their contribution to people's livelihoods in Ethiopia* [Online]. Available: <https://www.thebrooke.org/sites/default/files/Advocacy-and-policy/Ethiopia-livelihoods-2020-01.pdf> [Accessed 21 March 2023].
- AGUIRRE, V. & ORIHUELA, A. 2010. Assessment of the impact of an animal welfare educational course with first grade children in rural schools in the state of Morelos, Mexico. *Early Childhood Education Journal*, 38, 27-31.
- AL-AMER, R., RAMJAN, L., GLEW, P., DARWISH, M. & SALAMONSON, Y. 2016. Language translation challenges with Arabic speakers participating in qualitative research studies. *International journal of nursing studies*, 54, 150-157.
- ALAM, M., BHUIYAN, M. & BHUIYAN, A. 2016. The socio-economic status of horse owners in rural areas of Bangladesh. *The Agriculturalists*, 13 (1).
- ALI, A., ORION, S., TESFAYE, T. & ZAMBRISKI, J. A. 2016a. The prevalence of lameness and associated risk factors in cart mules in Bahir Dar, Ethiopia. *Tropical Animal Health and Production*, 48, 1483-1489.
- ALI, A. B. A., EL SAYED, M. A., MATOOCK, M. Y., FOUAD, M. A. & HELESKI, C. R. 2016b. A welfare assessment scoring system for working equids—A method for identifying at risk populations and for monitoring progress of welfare enhancement strategies (tried in Egypt). *Applied Animal Behaviour Science*, 176, 52-62.
- ALI, M., KALITA, J., PRADHAN, S. K. & GUPTA, P. 2014. Contribution of women in achieving sustainable welfare of equids: a case study from Brooke India [Conference poster]. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st 3rd July, 77-78.*
- ALJAZEERA. 2020. *Coronavirus: Travel restrictions, border shutdowns by country* [Online]. Available: <https://www.aljazeera.com/news/2020/6/3/coronavirus->

- [travel-restrictions-border-shutdowns-by-country](#) [Accessed 18 February 2022].
- ALLAN, F. 2021. *A Landscaping Analysis of Working Equid Population Numbers in LMICs, with Policy Recommendations* [Online]. Available: [https://www.thebrooke.org/sites/default/files/Images/Equid\\_Population\\_Landscaping\\_Analysis.pdf](https://www.thebrooke.org/sites/default/files/Images/Equid_Population_Landscaping_Analysis.pdf) [Accessed 22 March 2023].
- ALUJA, A. S. D. 1998. The welfare of working equids in Mexico. *Applied Animal Behaviour Science*, 59, 19-29.
- ALZATE, M. M., MATAS, J. L., DONGARWAR, D. & HIRTH, J. M. 2024. Gender role beliefs and adolescent pregnancy in Colombia: findings from the 2015 DHS survey. *Culture, Health & Sexuality*, 26, 30-45.
- AMBLER, K., HERSKOWITZ, S. & MAREDA, M. K. 2021. Are we done yet? Response fatigue and rural livelihoods. *Journal of Development Economics*, 153, 102736.
- AMERICAN ASSOCIATION OF EQUINE PRACTITIONERS. *Colic: Minimizing its Incidence and Impact in your Horse* [Online]. Available: <https://aaep.org/horsehealth/colic-minimizing-its-incidence-and-impact-your-horse> [Accessed 14 December 2023].
- ANGARA, T. E., ISMAIL, A. A. & IBRAHIM, A. M. 2011. The role of donkeys in income generation and the impact of endoparasites on their performance. *Journal of Veterinary Medicine and Animal Production*, 2, 65-89.
- ARCHER, D., PINCHBECK, G., FRENCH, N. & PROUDMAN, C. 2008a. Risk factors for epiploic foramen entrapment colic in a UK horse population: a prospective case-control study. *Equine Veterinary Journal*, 40, 405-410.
- ARCHER, D., PINCHBECK, G., FRENCH, N. & PROUDMAN, C. 2008b. Risk factors for epiploic foramen entrapment colic: an international study. *Equine veterinary journal*, 40, 224-230.
- ARCHER, D. C., COSTAIN, D. A. & SHERLOCK, C. 2014. Idiopathic focal eosinophilic enteritis (IFEE), an emerging cause of abdominal pain in horses: the effect of age, time and geographical location on risk. *PLoS One*, 9, e112072.
- ARCHER, D. C., PINCHBECK, G. L., PROUDMAN, C. J. & CLOUGH, H. E. 2006. Is equine colic seasonal? Novel application of a model based approach. *BMC veterinary research*, 2, 1-11.
- ARCHER, D. C. & PROUDMAN, C. J. 2006. Epidemiological clues to preventing colic. *The Veterinary Journal*, 172, 29-39.
- ARLINGHAUS, K. R. & JOHNSTON, C. A. 2018. Advocating for Behavior Change With Education. *American Journal of Lifestyle Medicine*, 12, 113-116.
- ARRIAGA-JORDÁN, C., PEDRAZA-FUENTES, A., VELÁZQUEZ-BELTRÁN, L., NAVABERNAL, E. & CHÁVEZ-MEJÍA, M. 2005. Economic contribution of draught animals to Mazahua smallholder Campesino farming systems in the highlands of Central Mexico. *Tropical Animal health and production*, 37, 589-597.
- ARRIAGA-JORDAN, C. M., COLUNGA-GONZALEZ, B. & VELAZQUEZ-BELTRAN, L. G. 2007. The contribution of working equines to sustainable rural livelihoods. *Fifth International Colloquium on Working Equines*, Addis Ababa, Ethiopia, 30 October-2 November, 2006 ; 2007.
- ASHLEY, F., WATERMAN-PEARSON, A. & WHAY, H. 2005. Behavioural assessment of pain in horses and donkeys: application to clinical practice and future studies. *Equine veterinary journal*, 37, 565-575.
- ATTWOOD, G., UPJOHN, M. & VERHEYEN, K. What impact does skills training have? A tracer study of students of a saddlery, farriery, and business skills training

- programme conducted in Lesotho in 2007. The 6th International Colloquium on Working Equids: learning from others. Proceedings of an International Colloquium, New Delhi, India, 29 November-2 December 2010, 2010. The Brooke, 18-19.
- BACK, H., NYMAN, A. & LIND, E. O. 2013. The association between *Anoplocephala perfoliata* and colic in Swedish horses—A case control study. *Veterinary Parasitology*, 197, 580-585.
- BAKER, J., STRINGER, H. & MCKEAN, C. 2024. Ensuring treatment fidelity in intervention studies: Developing a checklist and scoring system within a behaviour change paradigm. *International Journal of Language & Communication Disorders*, 59, 379-395.
- BAKER, R., CAMOSSO-STEFINOVIC, J., GILLIES, C., SHAW, E. J., CHEATER, F., FLOTTORP, S., ROBERTSON, N., WENSING, M., FIANDER, M., ECCLES, M. P. & ET AL. 2015. Tailored interventions to address determinants of practice. *Cochrane Database of Systematic Reviews*.
- BARKER, F., ATKINS, L. & DE LUSIGNAN, S. 2016. Applying the COM-B behaviour model and behaviour change wheel to develop an intervention to improve hearing-aid use in adult auditory rehabilitation. *International journal of audiology*, 55, S90-S98.
- BARNETT-HOWELL, Z., WATSON, O. J. & MOBARAK, A. M. 2021. The benefits and costs of social distancing in high- and low-income countries. *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 115, 807-819.
- BARTHOLOMEW ELDREDGE, L. K., MARKHAM, C. M., RUITER, R. A., FERNÁNDEZ, M. E., KOK, G. & PARCEL, G. S. 2016. *Planning health promotion programs: an intervention mapping approach*, Jossey-Bass, John Wiley & Sons.
- BAYDALA, L., LETENDRE, S., RUTTAN, L., WORRELL, S., FLETCHER, F., LETENDRE, L. & SCHRAMM, T. 2011. "Why Do I Need to Sign it? Issues in Carrying Out Child Assent in School-Based Prevention Research Within a First Nation Community. *First Peoples Child & Family Review*, 6, 99-113.
- BAYVEL, A. D. & CROSS, N. 2010. Animal welfare: a complex domestic and international public-policy issue—who are the key players? *Journal of Veterinary Medical Education*, 37, 3-12.
- BAZEZEW, M., CHANIE, M., TESFAYE, T., KASSA, A., MEKONNEN, B. & WAGAW, N. 2014. Lameness and associated risk factors in cart mules in northwestern Ethiopia. *Global Veterinaria*, 12, 869-77.
- BEKELE, M., LEGGESE, G., TESHOME, W., NAHOM, W., ANTENEH, K. & TEWODROS, T. 2014. Socioeconomic impact of epizootic lymphangitis in cart mules in Bahir Dar city, North West Ethiopia. *The 7th International Colloquium on Working Equids*. Royal Holloway, University of London, UK.
- BERKLEY, S. 2021. *Vaccine nationalism will leave everyone more at risk of coronavirus* [Online]. Available: <https://institutions.newscientist.com/article/mg24933201-800-vaccine-nationalism-will-leave-everyone-more-at-risk-of-coronavirus/> [Accessed 18 February 2022].
- BIFFA, D. 2006. Causes and factors associated with occurrence of external injuries in working equines in Ethiopia. *International Journal of Applied Research in Veterinary Medicine*, 4, 1-7.
- BIRKÁS, B., TÓTH, G., BALKU, E., NÁRAI, E. & VITRAI, J. 2021. Defining healthstyles to plan behavior change interventions in representative samples of children and adults. *Psychology, Health & Medicine*, 26, 566-570.

- BIRUKOU, A., BLANZIERI, E., GIORGINI, P. & GIUNCHIGLIA, F. 2013. A formal definition of culture. *Models for intercultural collaboration and negotiation*, 1-26.
- BISHOP, G., COONEY, K., COX, S., DOWNING, R., MITCHENER, K., SHANAN, A., SOARES, N., STEVENS, B. & WYNN, T. 2016. 2016 AAHA/IAAHPC End-of-Life Care Guidelines. *Journal of the American Animal Hospital Association*, 52, 341-356.
- BJERKESET, O., NORDAHL, H. M., LARSSON, S., DAHL, A. A. & LINAKER, O. 2008. A 4-year follow-up study of syndromal and sub-syndromal anxiety and depression symptoms in the general population: the HUNT study. *Social Psychiatry and Psychiatric Epidemiology*, 43, 192-199.
- BLIKSLAGER, A. T. 2017. Pathophysiology of gastrointestinal obstruction and strangulation. *The Equine Acute Abdomen*, 102-118.
- BLOOR, M. 2001. *Focus groups in social research*, SAGE publications, Sage.
- BLUE CROSS. 2023. *Horse colic prevention and management* [Online]. Available: <https://www.bluecross.org.uk/advice/horse/health-and-injuries/horse-colic-prevention-and-management> [Accessed 14 December 2023].
- BOJIA, E., FESEHA, G., ALEMAYEHU, F., AYELE, G., TESFAYE, M., TRAWFORD, A. & ANZUINO, J. A comprehensive approach to minimise the fatal effects of tetanus and colic in donkeys of Ethiopia. Proceedings of the 5th International Colloquium on Working Equines, Addis Ababa, Ethiopia, 2006.
- BOLES, C. L. & KOHN, C. W. 1977. Fibrous foreign body impaction colic in young horses. *Journal of American Veterinary Medical Association*, 171, 193-5.
- BONNET, F., VANEK, J. & CHEN, M. 2019. Women and men in the informal economy: A statistical brief. *International Labour Office, Geneva*, 20.
- BONSI, M., ANDERSON, N. E. & CARDER, G. 2023a. The Socioeconomic Impact of Diseases of Working Equids in Low and Middle-Income Countries: A Critical Review. *Animals*, 13, 3865.
- BONSI, M., ANDERSON, N. E. & CARDER, G. 2023b. The socioeconomic impact of equine epizootic lymphangitis in working equids in low and middle-income countries: a scoping review. *Journal of equine veterinary science*, 104981.
- BOWDEN, A., BURFORD, J. H., BRENNAN, M. L., ENGLAND, G. C. W. & FREEMAN, S. L. 2020a. Horse owners' knowledge, and opinions on recognising colic in the horse. *Equine Vet J*, 52, 262-267.
- BOWDEN, A., ENGLAND, G., BURFORD, J., MAIR, T., FURNESS, W. & FREEMAN, S. 2017. Prevalence and outcome of conditions seen at out-of-hours primary assessment at two practices over a 3-year period (2011–2013). *Equine Veterinary Journal*, 49.
- BOWDEN, A., ENGLAND, G. C. W., BRENNAN, M. L., MAIR, T. S., FURNESS, W. A., FREEMAN, S. L. & BURFORD, J. H. 2020b. Indicators of 'critical' outcomes in 941 horses seen 'out-of-hours' for colic. *Veterinary Record*, 187, 492.
- BOYD, J., MCMILLAN, B., EASTON, K., DELANEY, B. & MITCHELL, C. 2020. Utility of the COM-B model in identifying facilitators and barriers to maintaining a healthy postnatal lifestyle following a diagnosis of gestational diabetes: a qualitative study. *BMJ open*, 10, e037318.
- BOYLE, A., TIMONEY, J. F., NEWTON, J., HINES, M., WALLER, A. & BUCHANAN, B. 2018. Streptococcus equi infections in horses: guidelines for treatment, control, and prevention of strangles—revised consensus statement. *Journal of Veterinary Internal Medicine*, 32, 633-647.
- BRAUN, V. & CLARKE, V. 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3, 77-101.

- BRIZGYS, L. A. 2018. *Working Equids: A Case Study Investigating if Locus of Control Affects Welfare in Central America*. Purdue University.
- BROSTER, C., BURN, C., BARR, A. & WHAY, H. 2009. The range and prevalence of pathological abnormalities associated with lameness in working horses from developing countries. *Equine Veterinary Journal*, 41, 474-481.
- BURDEN, F. A., DU TOIT, N., HERNANDEZ-GIL, M., PRADO-ORTIZ, O. & TRAWFORD, A. F. 2010. Selected health and management issues facing working donkeys presented for veterinary treatment in rural Mexico: some possible risk factors and potential intervention strategies. *Tropical Animal Health and Production*, 42, 597-605.
- BURFORD, J. 2019. *Investigating Socio-Economic Metrics of Low-Income Families Utilising Working Equids in Colombia* [Online]. Available: <https://www.nottingham.ac.uk/vet/news/research-global-engagement/investigating-socio-economic-metrics-of-low-income-families-utilising-working-equids-in-colombia.aspx> [Accessed 21 February 2022].
- BURN, C. C., DENNISON, T. L. & WHAY, H. R. 2010a. Environmental and demographic risk factors for poor welfare in working horses, donkeys and mules in developing countries. *The Veterinary Journal*, 186, 385-392.
- BURN, C. C., DENNISON, T. L. & WHAY, H. R. 2010b. Relationships between behaviour and health in working horses, donkeys, and mules in developing countries. *Applied Animal Behaviour Science*, 126, 109-118.
- BURN, C. C., PRITCHARD, J. C., FARAJAT, M., TWAISSI, A. A. & WHAY, H. R. 2008. Risk factors for strap-related lesions in working donkeys at the World Heritage Site of Petra in Jordan. *The Veterinary Journal*, 178, 263-271.
- BURNYEAT, G. 2018. *Chocolate, politics and peace-building: an ethnography of the peace community of San José de Apartadó, Colombia*, Springer.
- CAMPBELL, S., GREENWOOD, M., PRIOR, S., SHEARER, T., WALKEM, K., YOUNG, S., BYWATERS, D. & WALKER, K. 2020. Purposive sampling: complex or simple? Research case examples. *Journal of research in Nursing*, 25, 652-661.
- CAREY, M. A. & ASBURY, J.-E. 2016. *Focus group research*, Routledge.
- CARROLL, G., GROARKE, J. & GRAHAM-WISENER, L. 2021. Human behaviour change models for improving animal welfare. *Bridging Research Disciplines to Advance Animal Welfare Science: A Practical Guide*. CABI International
- CHRISTENSEN, U., SCHMIDT, L., BUDTZ-JØRGENSEN, E. & AVLUND, K. 2006. Group cohesion and social support in exercise classes: Results from a Danish intervention study. *Health education & behavior*, 33, 677-689.
- CHRISTOPHERSEN, M. T., DUPONT, N., BERG-SØRENSEN, K. S., KONNERUP, C., PIHL, T. H. & ANDERSEN, P. H. 2014. Short-term survival and mortality rates in a retrospective study of colic in 1588 Danish horses. *Acta Veterinaria Scandinavica*, 56, 20.
- CLARKE, V. & BRAUN, V. 2013. *Successful qualitative research: A practical guide for beginners*, SAGE Publications.
- CLOUGH, H., ROSHIER, M., ENGLAND, G., BURFORD, J. & FREEMAN, S. 2021. Qualitative study of the influence of horse-owner relationship during some key events within a horse's lifetime. *Veterinary Record*, 188, e79.
- COHEN, N., GIBBS, P. & WOODS, A. 1999. Dietary and other management factors associated with equine colic. *Journal of the American Veterinary Medical Association*, 45, 96-98.
- COHEN, N., MATEJKA, P., HONNAS, C. & HOOPER, R. 1995. Case-control study of the association between various management factors and development of colic

- in horses. Texas Equine Colic Study Group. *Journal of the American Veterinary Medical Association*, 206, 667-673.
- COHEN, N. & PELOSO, J. 1996. Risk factors for history of previous colic and for chronic, intermittent colic in a population of horses. *Journal of the American Veterinary Medical Association*, 208, 697-703.
- COOK, V. L. & HASSEL, D. M. 2014. Evaluation of the colic in horses: decision for referral. *Veterinary Clinics of North America: Equine Pract*, 30, 383-98, viii.
- COSTA RICA EQUINE WELFARE. 2023. *Sustainability Development Goals* [Online]. Available: <https://www.costaricaequinewelfare.org/sustainable-goals> [Accessed 23 March 2023].
- CRANE, M. A., KHALLAAYOUNE, K., SCANTLEBURY, C. & CHRISTLEY, R. M. 2011. A randomized triple blind trial to assess the effect of an anthelmintic programme for working equids in Morocco. *BMC Veterinary Research*, 7, 1.
- CUMMINGS, M. J., GOLDBERG, E., MWAKA, S., KABAJAASI, O., VITTINGHOFF, E., CATTAMANCHI, A., KATAMBA, A., KENYA-MUGISHA, N., JACOB, S. T. & DAVIS, J. L. 2017. A complex intervention to improve implementation of World Health Organization guidelines for diagnosis of severe illness in low-income settings: a quasi-experimental study from Uganda. *Implementation Science*, 12, 1-11.
- CURRAN, M. M., FESEHA, G. & SMITH, D. G. 2005. The Impact of Access to Animal Health Services on Donkey Health and Livelihoods in Ethiopia. *Tropical Animal Health and Production*, 37, 47-65.
- CURRAN, M. M. & SMITH, D. G. 2005. The impact of donkey ownership on the livelihoods of female peri-urban dwellers in Ethiopia. (Special issue: Nutrition and health of donkeys in the tropics). *Tropical Animal Health and Production*, 37, 67-86.
- CURTIS, L., BURFORD, J. H., ENGLAND, G. C. W. & FREEMAN, S. L. 2019. Risk factors for acute abdominal pain (colic) in the adult horse: A scoping review of risk factors, and a systematic review of the effect of management-related changes. *PLoS One*, 14, e0219307.
- CURTIS, L., BURFORD, J. H., THOMAS, J. S. M., CURRAN, M. L., BAYES, T. C., ENGLAND, G. C. W. & FREEMAN, S. L. 2015. Prospective study of the primary evaluation of 1016 horses with clinical signs of abdominal pain by veterinary practitioners, and the differentiation of critical and non-critical cases. *Acta Veterinaria Scandinavica*, 57, 1-12.
- DANIEL GERSZON MAHLER, N. Y., RUTH HILL, CHRISTOPH LAKNER, HAOYU WU, NOBUO YOSHIDA. 2022. *Pandemic, prices and poverty* [Online]. Available: <https://blogs.worldbank.org/opendata/pandemic-prices-and-poverty> [Accessed 3 March 2023].
- DAVIS, R., CAMPBELL, R., HILDON, Z., HOBBS, L. & MICHIE, S. 2015. Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health psychology review*, 9, 323-344.
- DE BRIYNE, N., DALLA VILLA, P., ELLIS, D., GOLAB, G., GRUSZYNSKI, K., HAMMOND-SEAMAN, A., MOODY, S., NOGA, Z., PAWLOSKI, E. & RAMOS, M. 2020. Overcoming the impact of Covid-19 on animal welfare: COVID-19 Thematic Platform on Animal Welfare. *OIE Bull*.
- DIJK, L. V., DUGUMA, B. E., GIL, M. H., MARCOPPIDO, G., OCHIENG, F., SCHLECHTER, P., STARKEY, P., WANGA, C. & ZANELLA, A. 2011. *The Role, Impact and Welfare of Working (Traction and Transport) Animals* [Online]. Available: <https://www.fao.org/3/i3381e/i3381e.pdf> [Accessed 22 March 2023].

- DOUMBIA, A. 2014. The contribution of working donkeys to the livelihoods of the population in Mali [Conference poster]. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st 3rd July*, 35, 35.
- DUKTI, S. & WHITE, N. A. 2009. Prognosticating Equine Colic. *Veterinary Clinics of North America: Equine Practice*, 25, 217-231.
- DUNCAN, I. J. & DAWKINS, M. S. The problem of assessing “well-being” and “suffering” in farm animals. Indicators Relevant to Farm Animal Welfare: A Seminar in the CEC Programme of Coordination of Research on Animal Welfare, organized by Dr. D. Smidt, and held in Mariensee, 9-10 November 1982, 1983. Springer, 13-24.
- DYER, O. 2021. Covid-19: Countries are learning what others paid for vaccines. *BMJ : British Medical Journal (Online)*, 372.
- DYSON, S. 2002. Lameness and poor performance in the sport horse: dressage, show jumping and horse trials. *Journal of Equine Veterinary Science*, 22, 145-150.
- EDOUARD, M., HANNAH, R., LUCAS, R.-G., CAMERON, A., DANIEL, G., CHARLIE, G., JOE, H., BOBBIE, M., SALONI, D., ESTEBAN, O.-O. & MAX, R. 2020a. *Coronavirus Pandemic (COVID-19)* [Online]. Available: <https://ourworldindata.org/coronavirus> [Accessed 22 June 2023].
- EDOUARD, M., HANNAH, R., LUCAS, R.-G., CAMERON, A., DANIEL, G., CHARLIE, G., JOE, H., BOBBIE, M., SALONI, D., ESTEBAN, O.-O. & MAX, R. 2020b. *Covid-19: Income Support and Debt Relief* [Online]. Available: <https://ourworldindata.org/covid-income-support-debt-relief#citation> [Accessed 3 March 2023].
- EGGER, D., MIGUEL, E., WARREN, S. S., SHENOY, A., COLLINS, E., KARLAN, D., PARKERSON, D., MOBARAK, A. M., FINK, G. & UDRY, C. 2021. Falling living standards during the COVID-19 crisis: Quantitative evidence from nine developing countries. *Science advances*, 7, eabe0997.
- ERDEMSURAKH, O., OCHIRBAT, K., GOMBOSUREN, U., TSERENDORJ, B., PUREVDORJ, B., VANAABAATAR, B., AOSHIMA, K., KOBAYASHI, A. & KIMURA, T. 2020. Seroprevalence of equine glanders in horses in the central and eastern parts of Mongolia. *Journal of Veterinary Medical Science*, 82, 1247-1252.
- ESPOSITO, N. 2001. From meaning to meaning: The influence of translation techniques on non-English focus group research. *Qualitative health research*, 11, 568-579.
- EVANS, D. 2003. Hierarchy of evidence: a framework for ranking evidence evaluating healthcare interventions. *Journal of clinical nursing*, 12, 77-84.
- EVANS, W. D., GERARD, R., SYMINGTON, L., SHAIKH, H. & AGHA, S. 2022. Implementation practice models for development in low- and middle-income countries: systematic review of peer-reviewed literature. *BMC Public Health*, 22, 1157.
- FAOSTAT. 2022. *Food and Agriculture Organization of the United Nations (FAO)* [Online]. Available: <https://www.fao.org/faostat/en/#data/QCL> [Accessed 11 April 2024].
- FERNANDEZ, M. E., RUITER, R. A. C., MARKHAM, C. M. & KOK, G. 2019. Intervention Mapping: Theory- and Evidence-Based Health Promotion Program Planning: Perspective and Examples. *Front Public Health*, 7, 209.
- FERNANDO, P. & STARKEY, P. Donkeys and development: socio-economic issues in the use and management of donkeys. *Donkeys, People and Development, A Resource Book of the Animal Traction Network for Eastern and Southern*



- Africa (ATNESA), Proceedings of the Improving Donkey Utilisation and Management ATNESA Workshop, Debre Zeit, Ethiopia, 1997. 5-9.
- FIELD, B., BOOTH, A., ILOTT, I. & GERRISH, K. 2014. Using the Knowledge to Action Framework in practice: a citation analysis and systematic review. *Implementation Science*, 9, 172.
- FIGUEROA, J. P., BOTTAZZI, M. E., HOTEZ, P., BATISTA, C., ERGONUL, O., GILBERT, S., GURSEL, M., HASSANAIN, M., KIM, J. H. & LALL, B. 2021a. Urgent needs of low-income and middle-income countries for COVID-19 vaccines and therapeutics. *The Lancet*, 397, 562-564.
- FIGUEROA, J. P., BOTTAZZI, M. E., HOTEZ, P., BATISTA, C., ERGONUL, O., GILBERT, S., GURSEL, M., HASSANAIN, M., KIM, J. H., LALL, B., LARSON, H., NANICHE, D., SHEAHAN, T., SHOHAM, S., WILDER-SMITH, A., STRUB-WOURGAFT, N., YADAV, P. & KANG, G. 2021b. Urgent needs of low-income and middle-income countries for COVID-19 vaccines and therapeutics. *The Lancet*, 397, 562-564.
- FINLAY, L. 2002. Negotiating the swamp: the opportunity and challenge of reflexivity in research practice. *Qualitative research*, 2, 209-230.
- FISCHER, E. H., DORNELAS, E. A. & GOETHE, J. W. 2001. Characteristics of people lost to attrition in psychiatric follow-up studies. *The Journal of nervous and mental disease*, 189, 49-55.
- FLETCHER, F., BAYDALA, L., LETENDRE, L., RUTTAN, L., WORRELL, S., LETENDRE, S. & SCHRAMM, T. 2012. "No lone person:" the ethics consent process as an ethical dilemma in carrying out community-based participatory research with a First Nations community. *Pimatisiwin: A Journal of Aboriginal & Indigenous Community Health*, 9.
- FLOTTORP, S. A., OXMAN, A. D., KRAUSE, J., MUSILA, N. R., WENSING, M., GODYCKI-CWIRKO, M., BAKER, R. & ECCLES, M. P. 2013. A checklist for identifying determinants of practice: A systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implementation Science*, 8, 35.
- FURTADO, T., PERKINS, E., PINCHBECK, G., MCGOWAN, C., WATKINS, F. & CHRISTLEY, R. 2022. Exploring human behavior change in equine welfare: Insights from a COM-B analysis of the UK's equine obesity epidemic. *Frontiers in Veterinary Science*, 9, 961537.
- GAGNON, J. E., KAMIN, S. B. & KEARNS, J. 2023. The impact of the COVID-19 pandemic on global GDP growth. *Journal of the Japanese and International Economies*, 68, 101258.
- GALEZZO, M.-A. & RODRÍGUEZ SUSA, M. 2021. The challenges of monitoring and controlling drinking-water quality in dispersed rural areas: a case study based on two settlements in the Colombian Caribbean. *Environmental Monitoring and Assessment*, 193, 373.
- GALINDO, F., DE ALUJA, A., CAGIGAS, R., HUERTA, L. A. & TADICH, T. A. 2018. Application of the Hands-On Donkey Tool for Assessing the Welfare of Working Equids at Tuliman, Mexico. *Journal of Applied Animal Welfare Science*, 21, 93-100.
- GEIGER, M., HOCKENHULL, J., BULLER, H., ENGIDA, G. T., GETACHEW, M., BURDEN, F. A. & WHAY, H. R. 2020. Understanding the attitudes of communities to the social, economic, and cultural importance of working donkeys in rural, peri-urban, and urban areas of Ethiopia. *Frontiers in Veterinary Science*, 6.
- GETA, T. 2015. The Role of Working Animals toward Livelihoods and Food Security in Selected Districts of Fafan Zone, Somali Region, Ethiopia. 33, 89-94.

- GETACHEW, M., FESEHA, G., TRAWFORD, A. & REID, S. 2008. A survey of seasonal patterns in strongyle faecal worm egg counts of working equids of the central midlands and lowlands, Ethiopia. *Tropical Animal Health and Production*, 40, 637-642.
- GETACHEW, M., TRAWFORD, A., FESEHA, G. & REID, S. 2010. Gastrointestinal parasites of working donkeys of Ethiopia. *Tropical animal health and production*, 42, 27-33.
- GHOTGE, N., RAMDAS, S., ASHALATA, S., MATHUR, N., BROOME, V. & SANYASI RAO, M. 2002. A social approach to the validation of traditional veterinary remedies—the ANTHRA Project. *Tropical Animal Health and Production*, 34, 121-143.
- GLANVILLE, C., ABRAHAM, C. & COLEMAN, G. 2020. Human behaviour change interventions in animal care and interactive settings: A review and framework for design and evaluation. *Animals*, 10, 2333.
- GLASGOW, R. E., VOGT, T. M. & BOLES, S. M. 1999. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health*, 89, 1322-7.
- GOBIERNO DE COLOMBIA. 2021. *Acelerar la implementación para una recuperación sostenible* [Online]. Available: [https://sustainabledevelopment.un.org/content/documents/282902021\\_VN\\_R\\_Report\\_Colombia.pdf](https://sustainabledevelopment.un.org/content/documents/282902021_VN_R_Report_Colombia.pdf) [Accessed 04 April 2024].
- GRACE, D. C., DIALL, O., SAVILLE, K., WARBOYS, D., WARD, P., WILD, I. & PERRY, B. D. 2022. The Global Contributions of Working Equids to Sustainable Agriculture and Livelihoods in Agenda 2030. *Ecohealth*, 19, 342-353.
- GREANEY, M. L., PULEO, E., SPRUNCK-HARRILD, K., HAINES, J., HOUGHTON, S. C. & EMMONS, K. M. 2018. Social Support for Changing Multiple Behaviors: Factors Associated With Seeking Support and the Impact of Offered Support. *Health Education and Behaviour*, 45, 198-206.
- GREENBAUM, T. L. 1998. *The handbook for focus group research*, Sage publications SAGE Publications.
- GREENSPUN, S. J. 2019. *A Gender Sensitive Fiscal Incidence Analysis for Latin America: Brazil, Colombia, the Dominican Republic, Mexico, and Uruguay*. Tulane University, Graduate Program in Biomedical Sciences.
- GUSTAVSON, K., VON SOEST, T., KAREVOLD, E. & RØYSAMB, E. 2012. Attrition and generalizability in longitudinal studies: findings from a 15-year population-based study and a Monte Carlo simulation study. *BMC Public Health*, 12, 918.
- HACKETT, E. S. 2013. *Specific causes of colic*, Wiley Blackwell.
- HADDY, E., BROWN, J., BURDEN, F., RAW, Z., KAMINSKI, J. & PROOPS, L. 2022. "What can we do to actually reach all these animals?" Evaluating approaches to improving working equid welfare. *PLoS One*, 17, e0273972.
- HADDY, E., BROWN, J., BURDEN, F., RAW, Z., KAMINSKI, J. & PROOPS, L. 2023a. Sustainability in NGO Programming: A Case Study of Working Equid Welfare Organizations. *SAGE Open*, 13.
- HADDY, E., BURDEN, F., FERNANDO-MARTÍNEZ, J. A., LEGARIA-RAMÍREZ, D., RAW, Z., BROWN, J., KAMINSKI, J. & PROOPS, L. 2021a. Evaluation of long-term welfare initiatives on working equid welfare and social transmission of knowledge in Mexico. *PLoS One*, 16, e0251002.
- HADDY, E., BURDEN, F., PRADO-ORTIZ, O., ZAPPI, H., RAW, Z. & PROOPS, L. 2021b. Comparison of working equid welfare across three regions of Mexico. *Equine Veterinary Journal*, 53, 763-770.

- HADDY, E., BURDEN, F. & PROOPS, L. 2020a. Shelter seeking behaviour of healthy donkeys and mules in a hot climate. *Applied animal behaviour science*, 222, 104898.
- HADDY, E., BURDEN, F., RAW, Z., RODRIGUES, J. B., ZAPPI BELLO, J. H., BROWN, J., KAMINSKI, J. & PROOPS, L. 2023b. Belief in animal sentience and affective owner attitudes are linked to positive working equid welfare across six countries. *Journal of Applied Animal Welfare Science*, 1-19.
- HADDY, E., RODRIGUES, J. B., RAW, Z., BURDEN, F. & PROOPS, L. 2020b. Documenting the Welfare and Role of Working Equids in Rural Communities of Portugal and Spain. *Animals*, 10.
- HADDY, E. C. 2022. *Understanding the role of environmental and human factors in working equid welfare*. PhD, University of Portsmouth.
- HALE, T., ANGRIST, N., KIRA, B., PETHERICK, A., PHILLIPS, T. & WEBSTER, S. 2020. Variation in government responses to COVID-19 *Blavatnik School of Government Working Paper*, 6.
- HAMMARBERG, M., EGENVALL, A., PFAU, T. & RHODIN, M. 2016. Rater agreement of visual lameness assessment in horses during lungeing. *Equine Veterinary Journal*, 48, 78-82.
- HANNA, D., SNEDDON, I. & BEATTIE, V. 2009. The relationship between the stockperson's personality and attitudes and the productivity of dairy cows. *Animal*, 3, 737-743.
- HARARI, D., KEEP, M. & BRIEN, P. 2021. *Coronavirus: Economic impact* [Online]. Available: <https://commonslibrary.parliament.uk/research-briefings/cbp-8866/#:~:text=Economic%20impact%20to%20date&text=GDP%20declined%20by%209.7%25%20in,two%20months%20earlier%20in%20February>. [Accessed 21 February 2022].
- HARDCASTLE, S. J., HANCOX, J., HATTAR, A., MAXWELL-SMITH, C., THØGERSEN-NTOUMANI, C. & HAGGER, M. S. 2015. Motivating the unmotivated: how can health behavior be changed in those unwilling to change? 6, 835.
- HARRIS, P. 1999. Review of equine feeding and stable management practices in the UK concentrating on the last decade of the 20th century. *Equine Veterinary Journal*, 31, 46-54.
- HASHEMZADEH, M., RAHIMI, A., ZARE-FARASHBANDI, F., ALAVI-NAEINI, A. M. & DAEI, A. 2019. Transtheoretical Model of Health Behavioral Change: A Systematic Review. *Iranian Journal of Nursing and Midwifery Research*, 24, 83-90.
- HASSAN, M. R., STEENSTRA, F. A. & UDO, H. M. J. 2013. Benefits of donkeys in rural and urban areas in northwest Nigeria. *African Journal of Agricultural Research*, 8, 6202-6212.
- HASSANPOUR, A., MOUSAVI, G. & TABRIZI, B. A retrospective study of equine colic risk factors in Tabriz area in Iran. *Proceedings of the 13th International Congress in Animal Hygiene*, 2007 Tartu, Estonia. 639.
- HEMSWORTH, L. M., JONGMAN, E. & COLEMAN, G. J. 2015. Recreational horse welfare: The relationships between recreational horse owner attributes and recreational horse welfare. *Applied Animal Behaviour Science*, 165, 1-16.
- HENNINK, M. M. 2007. *International focus group research: A handbook for the health and social sciences*, Cambridge University Press, Cambridge University Press.
- HILLYER, M., TAYLOR, F. & FRENCH, N. 2001. A cross-sectional study of colic in horses on Thoroughbred training premises in the British Isles in 1997. *Equine Veterinary Journal*, 33, 380-5.

- HILLYER, M., TAYLOR, F., PROUDMAN, C., EDWARDS, G., SMITH, J. & FRENCH, N. 2002. Case control study to identify risk factors for simple colonic obstruction and distension colic in horses. *Equine Veterinary Journal*, 34, 455-463.
- HOCKENHULL, J., BIRKE, L. & CREIGHTON, E. 2010. The horse's tale: Narratives of caring for/about horses. *Society & Animals*, 18, 331-347.
- HOCKENHULL, J. & WHAY, H. 2014. A review of approaches to assessing equine welfare. *Equine Veterinary Education*, 26, 159-166.
- HORSEMAN, S., WHAY, B., MULLAN, S., KNOWLES, T., BARR, A. & BULLER, H. 2016a. *Horses in our Hands*, World Horse Welfare.
- HORSEMAN, S. V., BULLER, H., MULLAN, S. & WHAY, H. R. 2016b. Current Welfare Problems Facing Horses in Great Britain as Identified by Equine Stakeholders. *PLoS One*, 11, e0160269.
- HUDSON, J. M., COHEN, N. D., GIBBS, P. G. & THOMPSON, J. A. 2001. Feeding practices associated with colic in horses. *Journal of the American Veterinary Medical Association*, 219, 1419-1425.
- HUGHES, C. M., CADOGAN, C. A. & RYAN, C. A. 2016. Development of a pharmacy practice intervention: lessons from the literature. *Int J Clin Pharm*, 38, 601-6.
- HUMAN DEVELOPMENT REPORTS. 2021. *Gender Inequality Index (GII)* [Online]. Available: <https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII> [Accessed 14 April 2023].
- INTERNATIONAL COALITION OF WORKING EQUIDS. 2023. *Achieving Agenda 2030: How the Welfare of Working Animals Delivers for Development* [Online]. Available: [https://storage.googleapis.com/worldhorsewelfare-cloud/2019/09/e4cf85cd-bdp02129\\_19-sdg2-brochure.pdf](https://storage.googleapis.com/worldhorsewelfare-cloud/2019/09/e4cf85cd-bdp02129_19-sdg2-brochure.pdf) [Accessed 21 March 2023].
- IQBAL, A., RAZA, S. & RIAZ, M. Developments and research in equine husbandry and welfare: some issues in Pakistan. Fifth International Colloquium on Working Equines. The future for working equines. Addis Ababa, Ethiopia, 30 October-2 November, 2007. The Donkey Sanctuary, 11-14.
- IREGUI-BOHÓRQUEZ, A. M., RAMÍREZ-GIRALDO, M. T. & TRIBÍN-URIBE, A. M. 2019. Domestic violence against rural women in Colombia: The role of labor income. *Feminist Economics*, 25, 146-172.
- IRELAND, J., CLEGG, P., MCGOWAN, C., PLATT, L. & PINCHBECK, G. 2011. Factors associated with mortality of geriatric horses in the United Kingdom. *Preventive Veterinary Medicine*, 101, 204-218.
- IRELAND, J., WYLIE, C., COLLINS, S., VERHEYEN, K. & NEWTON, J. 2013. Preventive health care and owner-reported disease prevalence of horses and ponies in Great Britain. *Research in Veterinary Science*, 95, 418-424.
- JAKOBSEN, H. 2012. Focus groups and methodological rigour outside the minority world: Making the method work to its strengths in Tanzania. *Qualitative Research*, 12, 111-130.
- JENNINGS, K., CURTIS, L., BURFORD, J. & FREEMAN, S. 2014. Prospective survey of veterinary practitioners' primary assessment of equine colic: clinical features, diagnoses, and treatment of 120 cases of large colon impaction. *BMC Veterinary Research*, 10 Suppl 1, S2.
- JEONG, D., AGGARWAL, S., ROBINSON, J., KUMAR, N., SPEAROT, A. & PARK, D. S. 2023. Exhaustive or exhausting? Evidence on respondent fatigue in long surveys. *Journal of Development Economics*, 161, 102992.

- JEPSON, R. G., HARRIS, F. M., PLATT, S. & TANNAHILL, C. 2010. The effectiveness of interventions to change six health behaviours: a review of reviews. *BMC Public Health*, 10, 1-16.
- JOHNSTON, M. & DIXON, D. 2008. Current issues and new directions in psychology and health: What happened to behaviour in the decade of behaviour? *Psychology and Health*, 23, 509-513.
- JÖNSSON, L., ROEPSTORFF, L., EGENVALL, A., NÄSHOLM, A., DALIN, G. & PHILIPSSON, J. 2013. Prevalence of clinical findings at examinations of young Swedish warmblood riding horses. *Acta Veterinaria Scandinavica*, 55, 1-13.
- JORDAN, T. & LEM, M. 2014. One health, one welfare: education in practice veterinary students' experiences with community veterinary outreach. *The Canadian Veterinary Journal*, 55, 1203.
- KALAMANOVA, A., STRINGER, A., FREEMAN, S. & BURFORD, J. 2015. Investigating the Normal Management Regimens of Working Equids and Identifying Barriers to the Recognition and Treatment of Colic by Owners in Morocco. *Equine Veterinary Journal*, 47, 5-5.
- KAMRAN, K., AKBAR, A., NASEEM, M., SAMAD, A., ACHAKZAI, J. K., REHMAN, Z. U., SOHAIL SAJID, M. & ALI, A. 2022. Participatory appraisal for healthcare and welfare management strategies of donkeys (*Equus asinus*) in Balochistan, Pakistan. *Frontiers in Veterinary Science*, 9, 1005079.
- KANDPAL, D. K., ZAMAN, S. F. & KUMAR, A. 2014. Study on the contribution of equids to the livelihoods of landless people in Indian brick kilns [Conference poster]. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st 3rd July*, 37-38.
- KANEENE, J. B., MILLER, R., ROSS, W. A., GALLAGHER, K., MARTENIUK, J. & ROOK, J. 1997. Risk factors for colic in the Michigan (USA) equine population. *Preventive Veterinary Medicine*, 30, 23-36.
- KAYA, G., SOMMERFELD-STUR, I. & IBEN, C. 2009. Risk factors of colic in horses in Austria. *Journal of Animal Physiology and Animal Nutrition*, 93, 339-349.
- KIELLAND, C., SKJERVE, E., ØSTERÅS, O. & ZANELLA, A. J. 2010. Dairy farmer attitudes and empathy toward animals are associated with animal welfare indicators. *Journal of Dairy Science*, 93, 2998-3006.
- KIMURA, B., MARSHALL, F., BEJA-PEREIRA, A. & MULLIGAN, C. 2013. Donkey domestication. *African Archaeological Review*, 30, 83-95.
- KING, S. R., PUERTO NÁJERA, J. L., SIERRA LIRA, E. M., ERALES VILLAMIL, J. A., BOLIO GONZÁLEZ, M. E., BROWN, M. P. & HERNÁNDEZ DE ANDA, J. A. 2009. Prevalence of lameness in carriage horses in Yucatan, Mexico. *The Journal of Applied Research in Veterinary Medicine*, 7, 206.
- KIROS, A., GEZAHEGN, M. & AYLATE, A. 2016. A cross sectional study on risk factors associated with lameness of working donkeys in and around Hawassa, Ethiopia. *Journal of Animal Health and Production*, 4, 87-94.
- KOK, G., GOTTLIEB, N. H., PETERS, G.-J. Y., MULLEN, P. D., PARCEL, G. S., RUITER, R. A., FERNÁNDEZ, M. E., MARKHAM, C. & BARTHOLOMEW, L. K. 2016. A taxonomy of behaviour change methods: an intervention mapping approach. *Health Psychology Review*, 10, 297-312.
- KRUEGER, R. A. 2014. *Focus groups: A practical guide for applied research*, SAGE Publications.
- KUBASIEWICZ, L., WATSON, T., NORRIS, S., CHAMBERLAIN, N., NYE, C., PERUMAL, R., SAROJA, R., RAW, Z. & BURDEN, F. 2022. One welfare: Linking poverty, equid ownership and equid welfare in the brick kilns of India. *Animal Welfare*, 31, 517-528.

- LAING, G., CHRISTLEY, R., STRINGER, A., AKLILU, N., ASHINE, T., NEWTON, R., RADFORD, A. & PINCHBECK, G. 2018. Respiratory disease and sero-epidemiology of respiratory pathogens in the working horses of Ethiopia. *Equine Veterinary Journal*, 50, 793-799.
- LANAS, R., LUNA, D. & TADICH, T. 2018. The relationship between working horse welfare and their owners' socioeconomic status. *Animal Welfare*, 27, 47-54.
- LATKIN, C. A. & KNOWLTON, A. R. 2015. Social Network Assessments and Interventions for Health Behavior Change: A Critical Review. *Journal of Behavioural Medicine* 41, 90-7.
- LEBARON, V. T., IRIBARREN, S. J., PERRI, S. & BECK, S. L. 2015. A practical field guide to conducting nursing research in low-and middle-income countries. *Nursing Outlook*, 63, 462-473.
- LEWA, A., MANGERO, J., KAJUME, J. & AKUMONYO, J. 2007. The unspoken enslavery. *Fifth International Colloquium on Working Equids*. Addis Ababa, Ethiopia.
- LIGHTFOOT, K. L., FROST, E., BURFORD, J. H., ENGLAND, G. C. & FREEMAN, S. L. 2023. Use of human behaviour change models to investigate horse owner intention to adopt emergency colic recommendations. *Equine Veterinary Journal*, 56, 147-158.
- LING, A., UPJOHN, M., WEBB, K., WALLER, A. & VERHEYEN, K. 2011. Seroprevalence of *Streptococcus equi* in working horses in Lesotho. *Veterinary Record*, 169, 72-72.
- LÖNKER, N. S., FECHNER, K. & ABD EL WAHED, A. 2020. Horses as a crucial part of one health. *Veterinary Sciences*, 7, 28.
- LUNA, D. & TADICH, T. A. 2019. Why should human-animal interactions be included in research of working equids' welfare? *Animals*, 9, 42.
- LUNA, D., VÁSQUEZ, R., YÁÑEZ, J. & TADICH, T. 2018. The relationship between working horse welfare state and their owners' empathy level and perception of equine pain. *Animal Welfare*, 27, 115-123.
- LUNA, D., VÁSQUEZ, R. A., ROJAS, M. & TADICH, T. A. 2017. Welfare Status of Working Horses and Owners' Perceptions of Their Animals. *Animals* 7, 56.
- MACKENZIE, J. S. & JEGGO, M. 2019. The One Health approach—Why is it so important? *Tropical Medicine and Infectious Disease*, 4, 88.
- MAGGS, H. C., AINSLIE, A. & BENNETT, R. M. 2021. Donkey Ownership Provides a Range of Income Benefits to the Livelihoods of Rural Households in Northern Ghana. *Animals* 11.
- MAHLER, D. G., YONZAN, N., HILL, R., LAKNER, C., WU, H. & YOSHIDA, N. 2022. *Pandemic, prices, and poverty* [Online]. Available: <https://blogs.worldbank.org/en/opendata/pandemic-prices-and-poverty> [Accessed 12 April 2024].
- MAICHOMO, M., KARANJA, T., OLUM, M., MAGERO, J., OKECH, T. & NYOIKE, N. 2019. *The Status of Donkey Slaughter in Kenya and its Implications on Community Livelihoods* [Online]. Available: <https://www.thebrooke.org/sites/default/files/Kalro%20Report-Final.pdf> [Accessed 21 March 2023].
- MAIR, T. & EDWARDS, B. 1998. Medical treatment of equine colic. *In Practice*, 20, 578-584.
- MAIR, T. S. & SMITH, L. J. 2005. Survival and complication rates in 300 horses undergoing surgical treatment of colic. Part 1: Short-term survival following a single laparotomy. *Equine Veterinary Journal*, 37, 296-302.

- MAJID, U., KIM, C., CAKO, A. & GAGLIARDI, A. R. 2018. Engaging stakeholders in the co-development of programs or interventions using Intervention Mapping: A scoping review. *PLoS One*, 13, e0209826.
- MCDONAGH, L. K., SAUNDERS, J. M., CASSELL, J., CURTIS, T., BASTAKI, H., HARTNEY, T. & RAIT, G. 2018. Application of the COM-B model to barriers and facilitators to chlamydia testing in general practice for young people and primary care practitioners: a systematic review. *Implementation Science*, 13, 1-19.
- MCDONALD, J. L. & CLEMENTS, J. 2019. Engaging with socio-economically disadvantaged communities and their cats: Human behaviour change for animal and human benefit. *Animals*, 9, 175.
- MCGOWAN, T. W., PHILLIPS, C. J., HODGSON, D. R., PERKINS, N. & MCGOWAN, C. M. 2012. Euthanasia in aged horses: relationship between the owner's personality and their opinions on, and experience of, euthanasia of horses. *Anthrozoös*, 25, 261-275.
- MEDINA, E. R. & QUINTANA, L. C. 2023. Between voices and silence: indigenous women and sexual offenses by men among the Arhuaco People. *Violence Against Women*.
- MEDINA, L. & SCHNEIDER, F. 2020. Shedding light on the shadow economy. *World Economics*, 21, 25-82.
- MEKURIA, S., MULACHEW, M. & ABEBE, R. 2013. Management practices and welfare problems encountered on working equids in Hawassa town, Southern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 5, 243-250.
- MELLOR, D. J. 2016. Updating animal welfare thinking: Moving beyond the "Five Freedoms" towards "a Life Worth Living". *Animals*, 6, 21.
- MELLOR, D. J., LOVE, S., WALKER, R., GETTINBY, G. & REID, S. W. 2001. Sentinel practice-based survey of the management and health of horses in northern Britain. *Veterinary Record*, 149, 417-23.
- MERCER, M. A., MCKENZIE, H. C., BYRON, C. R., PLEASANT, R. S., BOGERS, S. H., COUNCIL-TROCHE, R. M., WERRE, S. R., BURNS, T. & DAVIS, J. L. 2023. Pharmacokinetics and clinical efficacy of acetaminophen (paracetamol) in adult horses with mechanically induced lameness. *Equine Veterinary Journal*, 55, 524-533.
- MERRIDALE-PUNTER, M. S., WIETHOELTER, A. K., EL-HAGE, C. M. & HITCHENS, P. L. 2022. Prevalence and Factors Associated with Working Equid Lameness in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. *Animals* 12.
- MICHIE, S., STRALEN, M. M. V. & WEST, R. 2019. *The COM-B Model of Behaviour* [Online]. Available: [https://social-change.co.uk/files/02.09.19\\_COM-B\\_and\\_changing\\_behaviour\\_.pdf](https://social-change.co.uk/files/02.09.19_COM-B_and_changing_behaviour_.pdf) [Accessed 22 February 2022].
- MICHIE, S., VAN STRALEN, M. M. & WEST, R. 2011. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42.
- MILLER, W. R. & ROLLNICK, S. 2012. *Motivational interviewing: Helping people change*, Guilford press.
- MIRAZO, J., CARLUCCIO, J., GIL, M., CUNS, M., ROCCA, R. & VILA, F. 2012. Prevalence of obstructive colic due to foreign bodies in horses in the city of Montevideo. *Journal LAVECC*, 4, 159-173.
- MOHITE, D. Epidemiology of colic in working equids with reference to equine fairs in India: A review of 237 cases. Proceedings of the 7th International Colloquium on Working Equids, Surrey, UK, 1-3 July 2014. 1-3.

- MOHITE, D. S., SHEIKH, C. S., SINGH, S., KALITA, J., WILLIAMS, S. & COMPSTON, P. C. 2019. Using Qualitative Methods to Explore Farrier-Related Barriers to Successful Farriery Interventions for Equine Welfare in India. *Animals*, 9, 252.
- MOLLA, A. M., FENTAHUN, T. & JEMBERU, W. T. 2021. Estimating the economic impact and assessing owners' knowledge and practices of epizootic lymphangitis in equine cart animals in Central and South Gondar Zones, Amhara Region, Ethiopia. *Frontiers in Veterinary Science*, 8, 673442.
- MOORE, G. F., AUDREY, S., BARKER, M., BOND, L., BONELL, C., HARDEMAN, W., MOORE, L., O'CATHAIN, A., TINATI, T. & WIGHT, D. 2015. Process evaluation of complex interventions: Medical Research Council guidance. *The British Medical Journal*, 350.
- MOORE, J. 2022. *Colic in Horses* [Online]. Available: <https://www.msdevetmanual.com/horse-owners/digestive-disorders-of-horses/colic-in-horses> [Accessed 03 January 2024].
- MORGAN, R. The epidemiology of lameness in working donkeys in Addis Ababa and the central Oromia region of Ethiopia: a comparative study of urban and rural donkey populations. Fifth International Colloquium on Working Equines. The future for working equines. Addis Ababa, Ethiopia, 30 October-2 November,, 2007. *The Donkey Sanctuary*, 99-106.
- MORSE, J. M. 2015. Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative health research*, 25, 1212-1222.
- MURI, K., TUFTE, P., SKJERVE, E. & VALLE, P. 2012. Human-animal relationships in the Norwegian dairy goat industry: Attitudes and empathy towards goats (Part I). *Animal Welfare*, 21, 535-545.
- MURTA, S. G., SANDERSON, K. & OLDENBURG, B. 2007. Process Evaluation in Occupational Stress Management Programs: A Systematic Review. *American Journal of Health Promotion*, 21, 248-254.
- NASEER, S., KHALID, S., PARVEEN, S., ABBASS, K., SONG, H. & ACHIM, M. V. 2023. COVID-19 outbreak: Impact on global economy. *Frontiers in Public Health*, 10, 1009393.
- NICOLA, M., ALSAFI, Z., SOHRABI, C., KERWAN, A., AL-JABIR, A., IOSIFIDIS, C., AGHA, M. & AGHA, R. 2020. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185-193.
- NIELSEN, K. & ABILDGAARD, J. S. 2013. Organizational interventions: A research-based framework for the evaluation of both process and effects. *Work & Stress*, 27, 278-297.
- NIELSEN, K. & RANDALL, R. 2013. Opening the black box: Presenting a model for evaluating organizational-level interventions. *European Journal of Work and Organizational Psychology*, 22, 601-617.
- NOBLET, A. J. & LAMONTAGNE, A. D. 2008. 466 The Challenges of Developing, Implementing, and Evaluating Interventions. In: CARTWRIGHT, S. & COOPER, C. L. (eds.) *The Oxford Handbook of Organizational Well Being*. Oxford University Press.
- NOLAN, J. M., SCHULTZ, P. W., CIALDINI, R. B., GOLDSTEIN, N. J. & GRISKEVICIUS, V. 2008. Normative Social Influence is Underdetected. *Personality and Social Psychology Bulletin*, 34, 913-923.
- NORRIS, E. M. 2012. The constructive use of images in medical teaching: a literature review. *Journal of the Royal Society of Medicine: Short Reports*, 3, 33.
- NORRIS, S. L., KUBASIEWICZ, L. M., WATSON, T. L., LITTLE, H. A., YADAV, A. K., THAPA, S., RAW, Z. & BURDEN, F. A. 2020. A new framework for assessing equid



- welfare: A case study of working equids in Nepalese brick kilns. *Animals*, 10, 1074.
- NYE, C., WATSON, T., KUBASIEWICZ, L. M., RAW, Z. & BURDEN, F. 2021. 'Don't Put the Cart before the Mule!' Challenging Assumptions Regarding Health-Related Treatment Practices of Working Equid Owners in Northern India. *Animals*, 11, 1307.
- OLMOS-VEGA, F. M., STALMEIJER, R. E., VARPIO, L. & KAHLKE, R. 2023. A practical guide to reflexivity in qualitative research: AMEE Guide No. 149. *Medical teacher*, 45, 241-251.
- OREFF, G., TATZ, A., DAHAN, R., RAZ, T. & KELMER, G. 2020. Surgical management of foreign body obstruction of the small and large colons in 29 equids (2004–2016). *Equine Veterinary Education*, 32, 424-430.
- OUASSAT, M. Welfare assessment of working donkeys in Nouakchott (Mauritania). Fifth International Colloquium on Working Equines. The future for working equines. Addis Ababa, Ethiopia, 30 October-2 November, 2007. The Donkey Sanctuary, 130-137.
- PARK, J. & ZUNIGA, J. 2016. Effectiveness of using picture-based health education for people with low health literacy: An integrative review. *Cogent Medicine*, 3, 1264679.
- PELTIER, C., DICKSON, S., GRANDPIERRE, V., OLTEAN, I., MCGREGOR, L., HAGELTORN, E. & YOUNG, N. L. 2024. Culturally appropriate consent processes for community-driven indigenous child health research: a scoping review. *BMC medical ethics*, 25, 3.
- PINILLOS, R. G., APPLEBY, M. C., MANTECA, X., SCOTT-PARK, F., SMITH, C. & VELARDE, A. 2016. One Welfare—a platform for improving human and animal welfare. *Veterinary Record*, 179, 412-413.
- PINTO-MARROQUIN, M., CASTAÑO-URIBE, C., PÉREZ-TORRES, J., ARISTIZABAL, J. F., SANTOS-FITA, D., CHAPARRO, A. B. R. & SERIO-SILVA, J. C. 2022. Potential conflict as an opportunity for coexistence: cosmovision and attitudes of Arhuaco people towards jaguars. *Ethnobiology and Conservation*, 11, 1-27.
- POT, M., RUITER, R. A., PAULUSSEN, T. W., HEUVELINK, A., DE MELKER, H. E., VAN VLIET, H. J. & VAN KEULEN, H. M. 2018. Systematically developing a web-based tailored intervention promoting HPV-vaccination acceptability among mothers of invited girls using intervention mapping. *Frontiers in Public Health*, 6, 226.
- PRITCHARD, J. 2014. What role do working equids play in human livelihoods - and how well is this currently recognised? *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st 3rd July*.
- PRITCHARD, J., BARR, A. & WHAY, H. 2007. Repeatability of a skin tent test for dehydration in working horses and donkeys. *Animal Welfare*, 16, 181-183.
- PRITCHARD, J., UPJOHN, M. & HIRSON, T. 2018. Improving working equine welfare in 'hard-win' situations, where gains are difficult, expensive or marginal. *PLoS One*, 13, e0191950.
- PRITCHARD, J. C., LINDBERG, A. C., MAIN, D. C. J. & WHAY, H. R. 2005. Assessment of the welfare of working horses, mules and donkeys, using health and behaviour parameters. *Preventive Veterinary Medicine*, 69, 265-283.
- PROCHASKA, J. O. & VELICER, W. F. 1997. The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12, 38-48.
- PROUDMAN, C. 1992. A two year, prospective survey of equine colic in general practice. *Equine Veterinary Journal*, 24, 90-93.

- PROUDMAN, C., SMITH, J., EDWARDS, G. & FRENCH, N. 2002. Long-term survival of equine surgical colic cases. Part 2: modelling postoperative survival. *Equine Veterinary Journal*, 34, 438-443.
- PUBLIC HEALTH ENGLAND. 2020. *Coronavirus (COVID-19)* [Online]. Available: <https://www.gov.uk/government/publications/covid-19-guidance-on-social-distancing-and-for-vulnerable-people/guidance-on-social-distancing-for-everyone-in-the-uk-and-protecting-older-people-and-vulnerable-adults> [Accessed 18 February 2022].
- QUEIROZ, V. C., CARVALHO, R. C. D. & HELLER, L. 2020. New approaches to monitor inequalities in access to water and sanitation: The SDGs in Latin America and the Caribbean. *Water*, 12, 931.
- RALSTON, S. 2022. *Nutritional Diseases of Horses and Other Equids* [Online]. Available: <https://www.msdevetmanual.com/management-and-nutrition/nutrition-horses/nutritional-diseases-of-horses-and-other-equids> [Accessed 18 March 2024].
- RAMÍREZ-HERNÁNDEZ, A., POLO, G., ROBAYO-SÁNCHEZ, L. N., CRUZ-MALDONADO, O. A., IMBACUÁN-PANTOJA, W. O. & CORTÉS-VECINO, J. A. 2019. Gastrointestinal and pulmonary parasites of working horses from Colombia. *Veterinary Parasitology: Regional Studies and Reports*, 17, 100296.
- RAVALLION, M. 2020. *Pandemic Policies in Poor Places* [Online]. Available: <https://thedocs.worldbank.org/en/doc/544041587739875562-0050022020/original/PandemicpoliciesinpoorplacesCGDRavallion.pdf> [Accessed 3 March 2023].
- RAW, Z., RODRIGUES, J. B., RICKARDS, K., RYDING, J., NORRIS, S. L., JUDGE, A., KUBASIEWICZ, L. M., WATSON, T. L., LITTLE, H. & HART, B. 2020. Equid assessment, research and scoping (EARS): The development and implementation of a new equid welfare assessment and monitoring tool. *Animals*, 10, 297.
- REAGANS, R. & MCEVILY, B. 2003. Network structure and knowledge transfer: The effects of cohesion and range. *Administrative science quarterly*, 48, 240-267.
- REEVES, M. J., SALMAN, M. D. & SMITH, G. 1996. Risk factors for equine acute abdominal disease (colic): Results from a multi-center case-control study. *Preventive Veterinary Medicine*, 26, 285-301.
- REINEMEYER, C. R. & NIELSEN, M. K. 2009. Parasitism and colic. *Veterinary Clinics: Equine Practice*, 25, 233-245.
- REIX, C. E., BURN, C. C., PRITCHARD, J. C., BARR, A. R. & WHAY, H. R. 2014. The range and prevalence of clinical signs and conformation associated with lameness in working draught donkeys in Pakistan. *Equine Vet J*, 46, 771-7.
- RIOJA-LANG, F. C., CONNOR, M., BACON, H. & DWYER, C. M. 2020. Determining a Welfare Prioritization for Horses Using a Delphi Method. *Animals*, 10, 647.
- ROBINSON, O. C. 2014. Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative research in psychology*, 11, 25-41.
- RODAS, D. R. & PÉREZ, J. Design of an equine welfare network matrix as the implementation model for equine welfare projects in Guatemala. Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st-3rd July, 2014. World Horse Welfare, 58-62.
- RODRIGUES, J. B., SULLIVAN, R. J., JUDGE, A., NORRIS, S. L. & BURDEN, F. A. 2020. Quantifying poor working equid welfare in Nepalese brick kilns using a welfare assessment tool. *Veterinary Record*, 187, 445-445.

- RODRIGUEZ, S. A., RONCANCIO, A. M., SAVAS, L. S., LOPEZ, D. M., VERNON, S. W. & FERNANDEZ, M. E. 2018. Using intervention mapping to develop and adapt two educational interventions for parents to increase HPV vaccination among Hispanic adolescents. *Frontiers in public health*, 6, 164.
- ROGERS, S., LEE, N. Y., WHITE, J. & BELL, C. 2023. Perceptions of Cross-Cultural Challenges and Successful Approaches in Facilitating the Improvement of Equine Welfare. *Animals*, 13, 1724.
- ROMERO, M. H., MENESES, F. & SANCHEZ, J. A. 2022. Welfare assessment of horses and mules used in recreational and muleteer work in the Colombian coffee region. *Frontiers in Veterinary Science*, 9, 1031192.
- SACK, A., OLADUNNI, F. S., GONCHIGOO, B., CHAMBERS, T. M. & GRAY, G. C. 2020. Zoonotic diseases from horses: a systematic review. *Vector-Borne and Zoonotic Diseases*, 20, 484-495.
- SALEM, S. E., SCANTLEBURY, C. E., EZZAT, E., ABDELAAL, A. M. & ARCHER, D. C. 2017. Colic in a working horse population in Egypt: Prevalence and risk factors. *Equine Veterinary Journal*, 49, 201-206.
- SÁNCHEZ-CASANOVA, R. E., MASRI-DABA, M., ALONSO-DÍAZ, M. Á., MÉNDEZ-BERNAL, A., HERNÁNDEZ-GIL, M. & FERNANDO-MARTÍNEZ, J. A. 2014. Prevalence of cutaneous pathological conditions and factors associated with the presence of skin wounds in working equids in tropical regions of Veracruz, Mexico. *Tropical Animal Health and Production*, 46, 555-561.
- SANCHEZ, L. & ROBERTSON, S. 2014. Pain control in horses: what do we really know? *Equine Veterinary Journal*, 46, 517-523.
- SANTAMARIA, A., KANEYBIA, D., IZQUIERDO, M., CASTAÑEDA, A. N. & RANGEL, C. 2018. The Art of Midwifery among the Arhuaco People of Colombia. *Sacred Inception: Reclaiming the Spirituality of Birth in the Modern World*, 113.
- SAVILLE-TROIKE, M. 2008. *The ethnography of communication: An introduction*, John Wiley & Sons.
- SCANTLEBURY, C., ARCHER, D., PROUDMAN, C. & PINCHBECK, G. 2011. Recurrent colic in the horse: Incidence and risk factors for recurrence in the general practice population. *Equine Veterinary Journal*, 43, 81-88.
- SCANTLEBURY, C., ARCHER, D., PROUDMAN, C. & PINCHBECK, G. 2015a. Management and horse-level risk factors for recurrent colic in the UK general equine practice population. *Equine Veterinary Journal*, 47, 202-206.
- SCANTLEBURY, C., ZERFU, A., PINCHBECK, G., REED, K., GEBREAB, F., AKLILU, N., MIDEKSA, K. & CHRISTLEY, R. 2015b. Participatory appraisal of the impact of epizootic lymphangitis in Ethiopia. *Preventive Veterinary Medicine*, 120, 265-276.
- SCANTLEBURY, C. E., PERKINS, E., PINCHBECK, G. L., ARCHER, D. C. & CHRISTLEY, R. M. 2014. Could it be colic? Horse-owner decision making and practices in response to equine colic. *BMC Veterinary Research*, 10 Suppl 1, S1.
- SCHEELBEEK, P. F., HAMZA, Y. A., SCHELLENBERG, J. & HILL, Z. 2020. Improving the use of focus group discussions in low income settings. *BMC medical research methodology*, 20, 1-10.
- SCONE EQUINE HOSPITAL. *10 Steps to Managing Your Horse with Colic* [Online]. Available: <https://www.sconequinehospital.com.au/blog/2019/03/27/10-steps-to-managing-your-horse-with-colic/> [Accessed 14December 2023].
- SERRA, Y. A., COLÓN-LÓPEZ, V., SAVAS, L. S., VERNON, S. W., FERNÁNDEZ-ESPADA, N., VÉLEZ, C., AYALA, A. & FERNÁNDEZ, M. E. 2017. Using intervention mapping to develop health education components to increase colorectal cancer screening in Puerto Rico. *Frontiers in public health*, 5, 324.

- SHABIRALYANI, G., HASAN, K. S., HAMAD, N. & IQBAL, N. 2015. Impact of visual aids in enhancing the learning process case research: District Dera Ghazi Khan. *Journal of education and practice*, 6, 226-233.
- SHAH, Z., KHAN, S., NAWAZ, S. & SUHAIL, S. Effect of working hours, housing and water provision on body condition and saddle sores in working equines in brick kilns at Peshawar, Pakistan. Fifth International Colloquium on Working Equines. The future for working equines. Addis Ababa, Ethiopia, 30 October-2 November, 2007. The Donkey Sanctuary, 401-406.
- SHEGOG, R. & BEGLEY, C. E. 2017. Clinic-based mobile health decision support to enhance adult epilepsy self-management: an intervention mapping approach. *Frontiers in public health*, 5, 265345.
- SHELIMA, B., DINKA, H., ABELTI, A., MUME, T., GELETA, T. & CHALA, R. Major constraints and health management of carthorses in the mid Rift Valley of Ethiopia. Fifth International Colloquium on Working Equines. The future for working equines. Addis Ababa, Ethiopia, 30 October-2 November, 2007. The Donkey Sanctuary, 231-241.
- SHINITZKY, H. E. & KUB, J. 2001. The art of motivating behavior change: the use of motivational interviewing to promote health. *Public Health Nursing*, 18, 178-185.
- SINGER, E. & SMITH, M. 2002. Examination of the horse with colic: is it medical or surgical? *Equine Veterinary Education*, 14, 87-96.
- SINGH, A. 2021. Working Equids: Their Conditions, Invisible Earning and Challenges-A Review. *Asian Journal of Agricultural Extension, Economics & Sociology*, 39, 357-364.
- SINGH, G., SOODAN, J., SINGLA, L. & KHAJURIA, J. 2012. Epidemiological studies on gastrointestinal helminths in horses and mules. *Veterinary Practitioner*, 13, 23-27.
- SMARTSURVEY. 2023. *SmartSurvey* [Online]. Available: <https://www.smartsurvey.co.uk/> [Accessed 20 July 2023].
- SMITH, D. 2005. Use and management of donkeys by poor societies in peri-urban areas of Ethiopia. Final Technical Report. Centre for Tropical Veterinary Medicine (CTVM), UK.
- SNALUNE, K. 2008. Equine internal parasites; their types and management. *VN Times*, 7, 8-10.
- SOMMERVILLE, R., BROWN, A. F. & UPJOHN, M. 2018. A standardised equine-based welfare assessment tool used for six years in low and middle income countries. *PLoS One*, 13, e0192354.
- SOUTHWOOD, L. L. & FEHR, J. 2012. *Practical guide to equine colic*, John Wiley & Sons.
- SPRINGER, A. E., KELDER, S. H. & HOELSCHER, D. M. 2006. Social support, physical activity and sedentary behavior among 6th-grade girls: a cross-sectional study. *International Journal of Behavioural Nutrition and Physical Activity*, 3, 8.
- STARKEY, P. 2011. *Livestock for traction and transport: world trends, key issues and policy implications*. *Animal Production and Health Working Paper, Food and Agricultural Organisation (FAO)*.
- STECKLER, A., MCLEROY, K. R., GOODMAN, R. M., BIRD, S. T. & MCCORMICK, L. 1992. *Toward integrating qualitative and quantitative methods: An introduction*. Sage Publications Sage CA: Thousand Oaks, CA.
- STEWART, D. W. & SHAMDASANI, P. N. 2014. *Focus groups: Theory and practice*, Sage publications.

- STRINGER, A., BELL, C., CHRISTLEY, R., GEBREAB, F., TEFERA, G., REED, K., TRAWFORD, A. & PINCHBECK, G. 2011. A cluster-randomised controlled trial to compare the effectiveness of different knowledge-transfer interventions for rural working equid users in Ethiopia. *Preventive veterinary medicine*, 100, 90-9.
- STRINGER, A. P. 2014. Infectious diseases of working equids. *Veterinary Clinics of North America: Equine Practice*, 30, 695-718.
- STRINGER, A. P., CHRISTLEY, R. M., BELL, C., GEBREAB, F., TEFERA, G., REED, K., TRAWFORD, A. & PINCHBECK, G. L. 2017. Owner reported diseases of working equids in central Ethiopia. *Equine Veterinary Journal*, 49, 501-506.
- STRINGER, A. P., CHRISTLEY, R. M., BELL, C. E., GEBREAB, F., TEFERA, G., REED, K., TRAWFORD, A. & PINCHBECK, G. L. 2018. Evaluating the Efficacy of Knowledge-Transfer Interventions on Animal Health Knowledge of Rural Working Equid Owners in Central Ethiopia: A Cluster-Randomized Controlled Trial. *Frontiers in Veterinary Science*, 5.
- SUÁREZ-KRABBE, J. 2012. Identity and the preservation of being. *Social Identities*, 18, 335-353.
- SUMMERBELL, C. D., WATERS, E., EDMUNDS, L., KELLY, S. A., BROWN, T. & CAMPBELL, K. J. 2005. Interventions for preventing obesity in children. *Cochrane database of systematic reviews*.
- SUSTAINABLE DEVELOPMENT GOALS. 2016. *Sustainable Development Goals kick off with start of new year* [Online]. Available: <https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/> [Accessed 11 January 2024].
- SUTHERS, J., PINCHBECK, G., PROUDMAN, C. & ARCHER, D. 2013. Risk factors for large colon volvulus in the UK. *Equine veterinary journal*, 45, 558-563.
- SWANN, W. J. 2006. Improving the welfare of working equine animals in developing countries. *Applied Animal Behaviour Science*, 100, 148-151.
- TAMBS, K., RØNNING, T., PRESCOTT, C., KENDLER, K. S., REICHBORN-KJENNERUD, T., TORGERSEN, S. & HARRIS, J. R. 2009. The Norwegian Institute of Public Health twin study of mental health: examining recruitment and attrition bias. *Twin Research and Human Genetics*, 12, 158-168.
- TEMPLE, B. 1997. Watch your tongue: Issues in translation and cross-cultural research. *Sociology*, 31, 607-618.
- TEMPLE, B. & YOUNG, A. 2004. Qualitative research and translation dilemmas. *Qualitative research*, 4, 161-178.
- TESFAYE, A. & CURRAN, M. M. 2005. A longitudinal survey of market donkeys in Ethiopia. *Tropical animal health and production*, 37, 87-100.
- TESFAYE, M., BOJIA, E., FESEHA, G., AYELE, G., ALEMAYEHU, F., LEMESSA, G., MANHALISHAL, E., SEYIUM, F., AMARE, B. & DEREJE, N. Community-based harness development initiative for pack donkeys: a progress report, Ethiopia. The 6th International Colloquium on Working Equids: learning from others. Proceedings of an International Colloquium, New Delhi, India, 29 November-2 December 2010. The Brooke, 284-291.
- THE BRITISH HORSE SOCIETY. 2022a. *Are you ready to REACT to colic?* [Online]. Available: <https://www.bhs.org.uk/media/lakbnxgp/pocket-guide-final.pdf> [Accessed 18 September 2023].
- THE BRITISH HORSE SOCIETY. 2022b. *Colic in Horses* [Online]. Available: <https://www.bhs.org.uk/horse-care-and-welfare/health-care-management/horse-health/equine-diseases/colic/> [Accessed 24 Aug 2023].

- THE BRITISH HORSE SOCIETY. 2022c. *Reducing the Risk of Colic* [Online]. Available: <https://www.bhs.org.uk/media/ytdnn5zo/3-reducing-the-risk-of-colic-ud-2018.pdf> [Accessed 18 September 2023].
- THE BROOKE. 2016. *The Working Equid Veterinary Manual Chapter 11: The gastrointestinal system* [Online]. Available: <https://www.thebrooke.org/sites/default/files/Professionals/Working%20Equid%20Veterinary%20Manual/WEVM-chapter-11.pdf> [Accessed 04 January 2024].
- THE BROOKE. 2021. *The Economic Contributions of Working Equids in Senegal* [Online]. Available: <https://www.thebrooke.org/research-evidence/socio-economic-contribution-equids-senegal> [Accessed 02 May 2023].
- THE BROOKE. 2023. *Euthanasia* [Online]. Available: <https://www.thebrooke.org/sites/default/files/Professionals/Working%20Equid%20Veterinary%20Manual/WEVM-chapter-8.pdf> [Accessed 25 Aug 2023].
- THE DONKEY SANCTUARY. 2020a. *Colic in Donkeys* [Online]. Available: <https://www.thedonkeysanctuary.org.uk/sites/uk/files/2021-02/colic-in-donkeys-factsheet.pdf> [Accessed 18 September 2023].
- THE DONKEY SANCTUARY. 2020b. *Feeding Donkeys* [Online]. Available: <https://www.thedonkeysanctuary.org.uk/sites/uk/files/2020-09/feeding-donkeys-2020.pdf> [Accessed 18 September 2023].
- THE WORLD BANK. 2020a. *Literacy rate, adult total (% of people ages 15 and above)* [Online]. Available: <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?end=2021&start=2015&view=chart> [Accessed 22 June 2023].
- THE WORLD BANK. 2020b. *Water, sanitation, and hygiene: essential for well-being* [Online]. Available: <https://datatopics.worldbank.org/sdcatlas/archive/2020/goal-6-clean-water-and-sanitation/#:~:text=Access%20within%20countries%20also%20differs,more%20than%2040%20percentage%20points>. [Accessed 11 January 2024].
- THE WORLD BANK. 2021a. *Individuals using the Internet (% of population)- Low and middle income* [Online]. Available: <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=XO> [Accessed 22 June 2023].
- THE WORLD BANK. 2021b. *Poverty: Overview* [Online]. Available: <https://www.worldbank.org/en/topic/poverty/overview#1> [Accessed October 19, 2021].
- THE WORLD BANK. 2021c. *Rural population (% of total population) - Colombia* [Online]. Available: <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=CO> [Accessed 21 April 2023].
- THE WORLD BANK. 2022a. *Fact Sheet: An Adjustment to Global Poverty Lines* [Online]. Available: <https://www.worldbank.org/en/news/factsheet/2022/05/02/fact-sheet-an-adjustment-to-global-poverty-lines#9> [Accessed 02 November 2023].
- THE WORLD BANK. 2022b. *Understanding Poverty* [Online]. Available: <https://www.worldbank.org/en/topic/poverty/overview> [Accessed 03 November 2023].
- THIEMANN, A. K. & SULLIVAN, R. J. E. 2019. Gastrointestinal Disorders of Donkeys and Mules. *Veterinary Clinics of North America: Equine Practice*, 35, 419-432.

- TINKER, M. K., WHITE, N. A., LESSARD, P., THATCHER, C. D., PELZER, K. D., DAVIS, B. & CARMEL, D. K. 1997a. Prospective study of equine colic incidence and mortality. *Equine Veterinary Journal*, 29, 448-53.
- TINKER, M. K., WHITE, N. A., LESSARD, P., THATCHER, C. D., PELZER, K. D., DAVIS, B. & CARMEL, D. K. 1997b. Prospective study of equine colic risk factors. *Equine Veterinary Journal*, 29, 454-8.
- TONG, A., SAINSBURY, P. & CRAIG, J. 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19, 349-357.
- TRAUB-DARGATZ, J. L., KOPRAL, C. A., SEITZINGER, A. H., GARBER, L. P., FORDE, K. & WHITE, N. A. 2001. Estimate of the national incidence of and operation-level risk factors for colic among horses in the United States, spring 1998 to spring 1999. *Journal of the American Veterinary Medical Association*, 219, 67-71.
- TROST, J. E. 1986. Statistically nonrepresentative stratified sampling: A sampling technique for qualitative studies. *Qualitative sociology*, 9, 54-57.
- UNICEF. 2016. *UNICEF: Collecting water is often a colossal waste of time for women and girls* [Online]. Available: <https://www.unicef.org/press-releases/unicef-collecting-water-often-colossal-waste-time-women-and-girls> [Accessed 11 January 2024].
- UNOPS. *Access to clean water* [Online]. Available: <https://www.unops.org/news-and-stories/stories/access-to-clean-water> [Accessed 12 September 2023].
- UPJOHN, M., ATTWOOD, G., LEROTHOLI, T., PFEIFFER, D. & VERHEYEN, K. 2013. Quantitative versus qualitative approaches: A comparison of two research methods applied to identification of key health issues for working horses in Lesotho. *Preventive veterinary medicine*, 108, 313-320.
- UPJOHN, M. & VALETTE, D. 2014. The Relationship Between Working Equids and Women in Developing Countries. *Equine Veterinary Journal*, 46, 20-20.
- UPJOHN, M. & WELLS, K. 2018. Working equids: the welfare of those worked to their limit. *Are we pushing animals to their biological limits? Welfare and ethical implications*. CAB International Wallingford UK.
- UPJOHN, M. M., PFEIFFER, D. U. & VERHEYEN, K. L. P. 2014. Helping working Equidae and their owners in developing countries: Monitoring and evaluation of evidence-based interventions. *The Veterinary Journal*, 199, 210-216.
- UPJOHN, M. M., SHIPTON, K., LEROTHOLI, T., ATTWOOD, G. & VERHEYEN, K. L. 2010. Coprological prevalence and intensity of helminth infection in working horses in Lesotho. *Tropical Animal Health and Production*, 42, 1655-1661.
- VALDÉZ-CRUZ, M. P., HERNÁNDEZ-GIL, M., GALINDO-RODRÍGUEZ, L. & ALONSO-DÍAZ, M. Á. 2013. Gastrointestinal nematode burden in working equids from humid tropical areas of central Veracruz, Mexico, and its relationship with body condition and haematological values. *Tropical Animal Health and Production*, 45, 603-607.
- VALETTE, D. 2014a. *Invisible helpers. Women's views on the contributions of working donkeys, horses and mules to their lives* [Online]. London: The Brooke. Available: <https://www.thebrooke.org/sites/default/files/Brooke%20News/Invisible%20Helpers%20Report.pdf> [Accessed 12 April 2024].
- VALETTE, D. 2014b. *Invisible helpers. Women's views on the contributions of working donkeys, horses and mules to their lives. (Voices from Women. International Report May 2014)* [Online]. Available: <https://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=caba6&AN=20143204172>

[https://nusearch.nottingham.ac.uk/openurl/44NOTUK/44NOTUK?genre=article&atitle=Invisible+helpers.+Women%27s+views+on+the+contributions+of+working+donkeys%2C+horses+and+mules+to+their+lives.&title=Invisible+helpers.+Women%27s+views+on+the+contributions+of+working+donkeys%2C+horses+and+mules+to+their+lives&issn=&date=2014&volume=&issue=&spage=47&aualast=Valette%2C+D.&isbn=&char\\_set=utf8](https://nusearch.nottingham.ac.uk/openurl/44NOTUK/44NOTUK?genre=article&atitle=Invisible+helpers.+Women%27s+views+on+the+contributions+of+working+donkeys%2C+horses+and+mules+to+their+lives.&title=Invisible+helpers.+Women%27s+views+on+the+contributions+of+working+donkeys%2C+horses+and+mules+to+their+lives&issn=&date=2014&volume=&issue=&spage=47&aualast=Valette%2C+D.&isbn=&char_set=utf8) [Accessed].

- VALETTE, D. 2015. Invisible workers: the economic contributions of working donkeys, horses and mules to livelihoods. *Invisible workers: the economic contributions of working donkeys, horses and mules to livelihoods; 2015. 43 pp. 63*
- VALETTE, D. & UPJOHN, M. 2014. Voices from women: working equids as 'invisible helpers'. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st- 3rd July.*
- VAN DER LINDEN, M. A., LAFFONT, C. M. & VAN OLDRUITENBORGH-OOSTERBAAN, M. M. S. 2003. Prognosis in equine medical and surgical colic. *Journal of Veterinary Internal Medicine, 17, 343-348.*
- VAN DIJK, L., DUGUMA, B., HERNÁNDEZ GIL, M., MARCOPPIDO, G., OCHIENG, F., SCHLECHTER, P., STARKEY, P., WANGA, C. & ZANELLA, A. 2014. Role, impact and welfare of working (traction and transport) animals. *FAO Animal Production and Health Report (FAO)*
- VAN DIJK, L., PRITCHARD, J. C., PRADHAN, S. K. & WELLS, K. 2010. *Sharing the Load: a guide to improving the welfare of working animals through collective action*, Practical Action Publishing Ltd.
- VASANTHAKUMAR, M. A., UPJOHN, M. M., WATSON, T. L. & DWYER, C. M. 2021. 'All my animals are equal, but none can survive without the horse'. the contribution of working equids to the livelihoods of women across six communities in the Chimaltenango region of Guatemala. *Animals, 11.*
- VELAZQUEZ-BELTRAN, L. G., SANCHEZ-VERA, E., NAVA-BERNAL, E. G. & ARRIAGA-JORDAN, C. M. 2011. The role of working equines to livelihoods in current day campesino hill-slope communities in central Mexico. *Tropical Animal Health and Production, 43, 1623-1632.*
- VERITY, R., OKELL, L. C., DORIGATTI, I., WINSKILL, P., WHITTAKER, C., IMAI, N., CUOMO-DANNENBURG, G., THOMPSON, H., WALKER, P. G. T., FU, H., DIGHE, A., GRIFFIN, J. T., BAGUELIN, M., BHATIA, S., BOONYASIRI, A., CORI, A., CUCUNUBÁ, Z., FITZJOHN, R., GAYTHORPE, K., GREEN, W., HAMLET, A., HINSLEY, W., LAYDON, D., NEDJATI-GILANI, G., RILEY, S., VAN ELSLAND, S., VOLZ, E., WANG, H., WANG, Y., XI, X., DONNELLY, C. A., GHANI, A. C. & FERGUSON, N. M. 2020. Estimates of the severity of coronavirus disease 2019: a model-based analysis. *The Lancet Infectious Diseases, 20, 669-677.*
- VILÁ, C., LEONARD, J. A. & BEJA-PEREIRA, A. 2006. Genetic documentation of horse and donkey domestication. *Documenting domestication, 342-353.*
- WARMUTH, V., ERIKSSON, A., BOWER, M. A., BARKER, G., BARRETT, E., HANKS, B. K., LI, S., LOMITASHVILI, D., OCHIR-GORYAEVA, M. & SIZONOV, G. V. 2012. Reconstructing the origin and spread of horse domestication in the Eurasian steppe. *Proceedings of the National Academy of Sciences, 109, 8202-8206.*
- WATSON, T., KUBASIEWICZ, L. M., NYE, C., THAPA, S., NORRIS, S. L., CHAMBERLAIN, N. & BURDEN, F. A. 2022. "Not All Who Wander Are Lost": The Life Transitions and Associated Welfare of Pack Mules Walking the Trails in the Mountainous Gorkha Region, Nepal. *Animals, 12, 3152.*
- WATSON, T. L., KUBASIEWICZ, L. M., CHAMBERLAIN, N., NYE, C., RAW, Z. & BURDEN, F. A. 2020. Cultural "blind spots," social influence and the welfare of working



- donkeys in brick kilns in northern India. *Frontiers in Veterinary Science*, 7, 214.
- WEST, R. & MICHIE, S. 2019. UBC Briefing 9: A brief description of the PRIME Theory of Human Motivation. *Unlocking Behaviour Change*.
- WEST, R. & MICHIE, S. 2020. *A brief introduction to the COM-B Model of behaviour and the PRIME Theory of motivation* [Online]. Available: <https://doi.org/10.32388/WW04E6.2> [Accessed 12 April 2024].
- WHAY, H. R., DIKSHIT, A. K., HOCKENHULL, J., PARKER, R. M., BANERJEE, A., HUGHES, S. I., PRITCHARD, J. C. & REIX, C. E. 2015. Evaluation of changes in equine care and limb-related abnormalities in working horses in Jaipur, India, as part of a two year participatory intervention study. *PLoS One*, 10, e0126160.
- WHITE, J. & ROGERS, S. Keynote Presentation: Making animal welfare sustainable-human behaviour change for animal behaviour: the human element. Proceedings of the 11th International Veterinary Behaviour Meeting, 14-16th September 2017, Samorin, Slovakia, 2017. CABI Wallingford UK, 54-58.
- WHITE, N. Equine colic. American Association of Equine Practitioners, 2006. 109-174.
- WILD, I. 2018. *Disseminating evidence to equine practitioners*. Masters, University of Nottingham.
- WILD, I., FREEMAN, S., ROBLES, D., MATAMOROS, D., ORTIZ, M., RODRIGUEZ, J. & BURFORD, J. 2021a. Owners' Knowledge and Approaches to Colic in Working Equids in Honduras. *Animals* 11, 2087.
- WILD, I., GEDGE, A., BURRIDGE, J. & BURFORD, J. 2021b. The Impact of COVID-19 on the Working Equid Community: Responses from 1530 Individuals Accessing NGO Support in 14 Low- and Middle-Income Countries. *Animals*, 11, 1363.
- WILKINSON, S. 1998. Focus groups in health research: Exploring the meanings of health and illness. *Journal of health psychology*, 3, 329-348.
- WILLIAMS, J. M., RANDLE, H. & MARLIN, D. 2020. COVID-19: Impact on United Kingdom horse owners. *Animals*, 10, 1862.
- WITT, P., HAGEDOORN, S., KRANENBURG, L. & BOOM, R. 2021. The use of cola for the treatment of gastric impactions in equids. *Pferdeheilkunde Equine Medicine*, 37, 588-596.
- WOLFRAMM, I. A., DOUGLAS, J. & PEARSON, G. 2023. Changing hearts and minds in the equestrian world one behaviour at a time. *Animals*, 13, 748.
- WORLD BANK. 2023. *Poverty and Equity Brief: Colombia* [Online]. Available: [https://databankfiles.worldbank.org/public/ddpext\\_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global\\_POVEQ\\_COL.pdf](https://databankfiles.worldbank.org/public/ddpext_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global_POVEQ_COL.pdf) [Accessed 03 April 2024].
- WORLD HEALTH ORGANIZATION 2013. WHO traditional medicine strategy. *WHO traditional medicine strategy: 2014-2023*. World Health Organization.
- WORLD HEALTH ORGANIZATION. 2018. *Health inequalities and their causes* [Online]. Available: <https://www.who.int/news-room/facts-in-pictures/detail/health-inequities-and-their-causes> [Accessed 11 January 2024].
- WORLD HEALTH ORGANIZATION. 2020. *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020* [Online]. Available: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> [Accessed 18 February 2022].
- WORLD HEALTH ORGANIZATION. 2021. *The true death toll of COVID-19: Estimating global excess mortality* [Online]. Available:

<https://www.who.int/data/stories/the-true-death-toll-of-covid-19-estimating-global-excess-mortality> [Accessed 16 August 2024].

- WORLD HEALTH ORGANIZATION 2023. *Burden of disease attributable to unsafe drinking-water, sanitation and hygiene*, World Health Organization.
- WORLDOMETER. 2021. *Colombia population* [Online]. Available: <https://www.worldometers.info/world-population/colombia-population/> [Accessed October 19, 2021].
- YOSEPH, S., SMITH, D., MENGISTU, A., TEKLU, F., FIREW, T. & BETERE, Y. 2005. Seasonal variation in the parasite burden and body condition of working donkeys in East Shewa and West Shewa regions of Ethiopia. *Tropical Animal Health and Production*, 37, 35-45.
- YOUNG, A. F., POWERS, J. R. & BELL, S. L. 2006. Attrition in longitudinal studies: who do you lose? *Australian and New Zealand journal of public health*, 30, 353-361.
- ZAMAN, S. F., UPJOHN, M. & VALETTE, D. 2014. Working equids and women: a new paradigm in animal welfare [Conference poster]. *Proceedings of the 7th International Colloquium on Working Equids, Royal Holloway, University of London, UK. 1st-3rd July*, 159-161.

## Appendix I: Round One Covid-19 Survey (Chapter Two)

QUESTION NUMBER	QUESTION TEXT	ANSWER TEXT
1	<p>Participant Consent*:</p> <ul style="list-style-type: none"> <li>• I have read/listened to the Participant Information</li> <li>• I understand the purpose of the research and my role in it</li> <li>• I understand I may stop the interview at any point</li> <li>• I understand I have the right to withdraw from the project at any point</li> <li>• I understand that the study is anonymous and no personal information will be collected, and if results are published I will not be identified</li> <li>• I understand that the information collected will be stored by World Horse Welfare and only accessible by researchers</li> <li>• I understand I can contact the researchers/organisations if I wish to gain more information regarding this study</li> </ul> <p>I consent to taking part in this survey.</p>	<p>Yes</p> <p>No</p>
2	How are you conducting this survey	<p>Face-to-face</p> <p>By telephone</p> <p>Online</p> <p>Other (please specify)</p>

<b>3</b>	Country	Costa Rica Colombia Guatemala Honduras Nicaragua Panama Mexico Haiti South Africa Zimbabwe Lesotho Senegal Nepal Cambodia
<b>4</b>	Name of community	Open answer
<b>5</b>	Number of family members in household	Open answer
<b>6</b>	Number/ type of equids owned currently	Horse- open answer Mule- open answer
	Number/ type of equids owned before Covid-19 (e.g. January 2020)	Donkey- open answer
<b>7</b>	If the number has changed please comment why/what happened to equid(s)?	Open answer
<b>8</b>	Has there been a change in your equid's workload since Covid-19 (e.g. January 2020)?	Working more Working same Working less Not working
<b>9</b>	If your equid's workload has changed, why? (select all that apply)	Government enforcement/national restrictions Local enforcement/regulations Change in demand Change in financial situation Other (please specify)
<b>10</b>	What proportion of your monthly income is derived directly from your working equid? (approximately - 1-100%)- Currently	Open answer
	What proportion of your monthly income is derived directly from your working equid? (approximately - 1-100%)- Before Covid-19	

11	<p>Pandemic (e.g. January 2020)</p> <p>Has your monthly income from your working equid changed since Covid-19 pandemic? (e.g. January 2020)</p>	<p>Decreased</p> <p>Stayed the same</p> <p>Increased</p>
12	<p>What type of work is your equid doing? (select all that apply)- currently</p> <p>What type of work is your equid doing? (select all that apply)- Before Covid-19 Pandemic (e.g. January 2020)</p>	<p>Ranching/herding</p> <p>Crop transport</p> <p>Water transport</p> <p>People transport</p> <p>Ploughing</p> <p>Racing</p> <p>Tourism</p> <p>Freight transport</p> <p>Other transport</p> <p>Comments</p>
13	<p>If you sell your equid now would you expect to sell it for more or less than what you could sell it for in 2019 (e.g. January 2020)?</p>	<p>More</p> <p>Same</p> <p>Less</p> <p>Don't know</p> <p>Give examples if possible.</p>
14	<p>Has the total cost of owning/upkeep of your equid changed since Covid-19 (e.g. January 2020)?</p>	<p>Increased</p> <p>Same</p> <p>Decreased</p> <p>Don't know</p>
15	<p>Do you use any of these services? – Currently</p> <p>Do you use any of these services? – Before Covid-19 Pandemic (e.g. January 2020)</p>	<p>Farrier</p> <p>Vet</p> <p>Saddler/harness maker</p> <p>Paravets/ technicians /</p> <p>Agrovets/ dewormer/ medications</p> <p>Animal welfare assistance</p> <p>None of these</p> <p>Other (please specify)</p>
16	<p>Has the cost of using these services changed?</p>	<p>Increased</p> <p>Same</p> <p>Decreased</p> <p>Don't know</p>
17	<p>Has the availability of using these services changed?</p>	<p>Increased</p> <p>Same</p> <p>Decreased</p> <p>Don't know</p>

<b>18</b>	Have you seen any changes in the health of your equid since Covid-19 pandemic? (e.g. January 2020)	Improved Same Deteriorated Don't know Other (please specify)
<b>19</b>	If changed, please give examples	Open answer
<b>20</b>	How is happy/well is your equid currently?	Very poor Poor Good Very good Don't know Comments
<b>21</b>	Has there been a change in severity/frequency of any pre existing health problems in your equid since the Covid-19 pandemic? (e.g. January 2020)	Improved Same Deteriorated Don't know No pre-existing health problems If yes, please give examples
<b>22</b>	Have you seen any new health problems in your equid since Covid-19 pandemic? (e.g. January 2020)	Yes No Don't know If yes, please give examples
<b>23</b>	Has the weight/body condition of your equid changed since Covid-19 pandemic? (e.g. January 2020)	Increased weight Same Decreased weight Don't know
<b>24</b>	Have your total household monthly expenses/outgoings changed since the start of the pandemic? (e.g. January 2020)	Decreased Stayed the same Increased If changed, why?
<b>25</b>	Has your total household income changed since the Covid-19 pandemic? (e.g. January 2020)	Decreased Stayed the same Increased If changed, why?
<b>26</b>	Have you had to supplement	Family Friends Government

	your income in other ways, if so how?	NGOs Bank Money lender Extra jobs Aid support/remittances None of the above Comments
<b>27</b>	In your opinion is your financial situation better than others in the same community that do not have a working equid? – Currently	Better Same Worse Don't know
<b>28</b>	In your opinion is your financial situation better than others in the same community that do not have a working equid? – Before Covid-19 Pandemic (e.g. January 2020)	
<b>28</b>	What type of support schemes are currently available to you?	Financial Governmental assistance NGO support World Horse Welfare feed relief Don't know Other (please specify)
<b>29</b>	How easy are these schemes to access?	Very easy Easy Neither easy nor difficult Difficult Very difficult Don't know
<b>30</b>	Have you used any of these schemes?	Yes No Other (please specify)
<b>31</b>	If so, how beneficial did you find them?	Not beneficial Not very beneficial Beneficial Very beneficial Don't know
<b>32</b>	What are the most significant/immediate issues for you and your equid(s)	Feed Vet support Stabling

	please select all that apply	First aid Lack of income Your personal health Other (please specify)
<b>33</b>	Are there any support schemes to help directly with animal health?	Yes No Don't know If yes, please specify
<b>34</b>	Would you feel comfortable having outsiders entering your community?	Yes No Don't know Comments
<b>35</b>	What aid would you find most beneficial? (please select all that apply)	Vet support Feed Equid first aid Shoeing Vaccinations Anthelmintics/dewormer Financial support Other (please specify)
<b>36</b>	What is your current level of anxiety in regards to your own economy/livelihood?	Severe anxiety Moderate anxiety Mild anxiety No anxiety
<b>37</b>	Can you mention a positive aspect that has occurred due to Covid-19?	Open answer
<b>38</b>	Is there anything else you would like to mention/ ask?	Open answer



## Appendix II: Round Two Covid-19 Survey (Chapter Two)

QUESTION NUMBER	QUESTION TEXT	ANSWER TEXT
1	Participant consent ** - have read/ listened to the participant information -I understand the purpose of the research -I understand I may stop the interview at any point -I understand that my personal information will not be shared at any point -I understand that the information collected will only be accessed by researchers at World Horse Welfare -I understand data collected from this survey may be published -I understand that I may contact the researchers/ organisations if I have any questions --- I consent to taking part in this survey	Yes No
2	How are you conducting this survey?	Face-to-face By telephone Online Other (please specify)
3	Country	Costa Rica Colombia Guatemala Honduras Nicaragua Panama Mexico Haiti South Africa Zimbabwe Lesotho Senegal Nepal Nepal (India) Cambodia

4	Community code	Open answer
5	Number of household members	Open answer
6	Number/ type of equids owned currently	Horse Donkey Mule
7	If the number of equids owned has changed since the start of the Covid-19 pandemic (e.g. January 2020) please comment why/ what happened to equid(s)?	Open answer
8	What type of activities does your equid do currently	Brick kiln work Ranching/ herding Ploughing
	Income-generating activities	Tourism
	Non-income-generating activities	Racing Crop transport Family transport People transport (not family) Water transport Material transport Waste transport Firewood/ wood transport Fish transport Scrap metal transport/ collection Other (please specify in comments)
9	Has the type of work your equid does changed since the start of the Covid-19 pandemic (e.g. January 2020)?	Yes No Don't know Comments
10	Has there been a change in your equids workload since the start of the Covid-19 pandemic (e.g. January 2020)?	Working more Working the same Working less Don't know
11	If your equids workload has changed since the start of the Covid-19 pandemic (e.g. January 2020), why?	Open answer
12	What proportion of your monthly income is derived directly from your working equid?	None Less than half More than half All

	Currently	Don't know
	Since the start of the Covid-19 pandemic (e.g. January 2020)	
<b>13</b>	Has the amount of money you earn from your working equid changed since the start of the Covid-19 pandemic (e.g. January 2020)?	Decreased Stayed the same Increased Don't know
<b>14</b>	Has the total cost of owning/upkeep of your equid changes since the start of the Covid-19 pandemic (e.g. January 2020). This includes cost of feeds, stabling and services for your equid?	Increased Stayed the same Decreased Don't know
<b>15</b>	Have you had to make any changes to equid care since the start of the Covid-19 pandemic (e.g. January 2020)?	Change to cheaper food Reduced supplements Reduced frequency of shoeing Unable to purchase saddlery/ harness equipment Not using a farrier Not using a saddler Not using a CBEA Giving up equid(s) altogether None Other (please specify) Comments
<b>16</b>	What problem would you have if you lost your equid?	Open answer
<b>17</b>	If you were to lose your working equid, could you afford to replace it?	Yes No Don't know
<b>18</b>	How often do you carry out these procedures with your equid? Currently	Shoeing/ foot trimming Vaccinations De-worming Saddle or harness check
	Before Covid-19 pandemic (e.g. January 2020)	Teeth check Equid health check Equid health treatment

		<ul style="list-style-type: none"> <li>More than once a week</li> <li>Weekly</li> <li>Monthly</li> <li>Quarterly</li> <li>Biannually</li> <li>Annually</li> <li>Less than once a year</li> <li>Never</li> <li>Don't know</li> </ul>
<b>19</b>	Who carried out these procedures with your equid?	<ul style="list-style-type: none"> <li>Shoeing/ foot trimming</li> <li>Vaccinations</li> <li>Saddle or harness check</li> </ul>
	Currently	<ul style="list-style-type: none"> <li>Teeth check</li> </ul>
	Before Covid-19 pandemic (e.g. January 2020)	<ul style="list-style-type: none"> <li>Equid health check</li> <li>Equid health treatment</li> </ul>
		<ul style="list-style-type: none"> <li>Myself</li> <li>Family or friend</li> <li>Vet (government, NGO or private)</li> <li>Veterinary pharmacy</li> <li>Village vet/ paravet</li> <li>Saddler/ harness maker</li> <li>Agrovet</li> <li>Animal welfare assistant</li> <li>Farrier</li> <li>Partner organisation</li> <li>Other</li> <li>My equid does not have this done</li> </ul>
<b>20</b>	Has the cost of using any equid services changed since the start of the Covid-19 pandemic (e.g. January 2020)?	<ul style="list-style-type: none"> <li>Increased</li> <li>Same</li> <li>Decreased</li> <li>Don't know</li> <li>If changed, which service(s)</li> </ul>
<b>21</b>	Has the availability of using any equid services changed since the start of the Covid-19 pandemic (e.g. January 2020)?	<ul style="list-style-type: none"> <li>Increased</li> <li>Same</li> <li>Decreased</li> <li>Don't know</li> <li>If changes, which service(s)</li> </ul>
<b>22</b>	Have you seen any of the following health problems with your equid?	<ul style="list-style-type: none"> <li>Skin wounds</li> <li>Colic</li> <li>Lameness + hoof problems</li> </ul>
	Before Covid-19 pandemic (e.g. January 2020)	<ul style="list-style-type: none"> <li>Weight loss</li> <li>Parasite problems (including ticks)</li> <li>Respiratory problems</li> <li>Behavioural problems</li> </ul>
	Within the last 3 months	

		Other (please specify in comments) No health problems Comments
23	Has the weight/ body condition score of your equid changed since the start of the Covid-19 pandemic (e.g. January 2020)?	Increased weight Stayed the same Decreased weight Don't know
24	Has the cost of living changed since the start of the Covid-19 pandemic (e.g. January 2020)?	Decreased Stayed the same Increased Don't know If changed, why?
25	Has your total household income changed since the Covid-19 pandemic (e.g. January 2020)?	Decreased Stayed the same Increased Don't know If changed, why?
26	Have you needed extra money since the start of the Covid-19 pandemic (e.g. January 2020)? If so, where from?	Family Friends Government NGOs Bank Money lenders Extra jobs Aid support/ remittances I have not had to supplement my income Other (please specify)
27	In your opinion is your financial situation better than others in the same community that do not have a working equid?  Currently  Before Covid-19 pandemic (e.g. January 2020)	Better Same Worse Don't know
28	What is the biggest problem for you and your family at the moment?	Personal health Lack of income Change in cost of living Other (please specify)
29	How do you feel about your personal livelihood?	Very bad/ worried Slightly bad/ worried Neither good or bad Slightly good Very good

		Don't know
<b>30</b>	Have you had access to the Covid-19 vaccine?	Yes, I have had the vaccine I have been offered the vaccine but do not want it No, I have not been offered the vaccine yet Don't know
<b>31</b>	Is there anything else you would like to mention/ ask?	Open answer

## Appendix III: Focus Group Schedule (Chapter Three)

### Focus Group 1: Owners of Working Equids

#### Section A: Municipality characteristics and challenges

**1. How would you describe the municipality of (enter name of region)?**

*Q1 Prompt: What is the main industry in your municipality?*

*Q1 Prompt: What utilities are available in your municipality?*

*Q1 Prompt: What is the prosperity of families within your municipality like?*

*\*sliding scale\*?*

*Q1 Prompt: How accessible is the infrastructure of your municipality?*

**2. What are the different roles of your family members?**

**3. What challenges is your municipality currently facing, and how has this changed over time?**

*Q3 Prompt: Are the challenges you describe from within last 3 – 4 years?*

*Q3 Prompt: Are these challenges currently unresolved?*

**4. What do you think is the main cause of these challenges?**

#### Section B: Role of working equids and associated welfare challenges

**1. What role does your working equid have in the daily life of your family?**

*Q1 Prompt: Can you think of any benefits or negatives to owning a working equid?*

**2. What role do your family members have in the daily care of your working equids?**

- 3. What general challenges are working equids currently facing, and how has this changed over time?**

*Q3 Prompt: Are the challenges you describe from within last 3 – 4 years?*

*Q3 Prompt: Are these challenges currently unresolved?*

### **Section C: Overcoming Challenges**

- 1. What do you think could, or should, be done to help you and your municipality overcome the challenges you currently face?**

*Q1 Prompt: How do you think this help could be provided?*

- 2. How are working equids viewed by people in your municipality?**

*Q2 Prompt: Who do you think benefits most from the working equids in your municipality?*

- 3. Do you think the role of working equids within your municipality has changed over time?**

- 4. How would you feel if working equids were removed from your municipality?**

- 5. If you were offered a motorised vehicle in return for your working equid, what would you do?**

*Q5 Prompt: How do you think your municipality would view a scheme such as this?*



**Focus Group 2: Female Participants Only / Indirect Contacts (e.g., Mayor, Farrier, non-equid owner)**

**Section A: Municipality characteristics and challenges**

1. **How would you describe the municipality of** *(enter name of region)*?

**Q1 Prompt:** *What is the main industry in your municipality?*

**Q1 Prompt:** *What utilities are available in your municipality?*

**Q1 Prompt:** *What is the prosperity of families within your municipality like?*

*\*sliding scale\*?*

**Q1 Prompt:** *How accessible is the infrastructure of your municipality?*

2. **What are the different roles of your family members?**

3. **What challenges is your municipality currently facing, and how has this changed over time?**

**Q3 Prompt:** *Are the challenges you describe from within last 3 – 4 years?*

**Q3 Prompt:** *Are these challenges currently unresolved?*

4. **What do you think is the main cause of these challenges?**

**Section B: Role of working equids and associated welfare challenges**

1. **What role do working equids have in the daily life of you and your family?**

**Q1 Prompt:** *Can you think of any benefits or negatives associated with having working equids in your municipality?*

2. **What general challenges are the working equids in your municipality currently facing, and how has this changed over time?**

**Q2 Prompt:** *Are the challenges you describe from within last 3 – 4 years?*

**Q2 Prompt:** *Are these challenges currently unresolved?*

### **Section C: Overcoming Challenges**

**1. What do you think could, or should, be done to help you and your municipality overcome the challenges you currently face?**

**Q1 Prompt:** *How do you think this help could be provided?*

**2. How are working equids viewed by people in your municipality?**

**Q2 Prompt:** *Who do you think benefits most from the working equids in your municipality?*

**3. Do you think the role of working equids within your municipality has changed over time?**

**4. How would you feel if working equids were removed from your municipality?**

**5. How do you think your municipality would view a scheme which aimed to replace working equids with motorised vehicles?**

**Q5 Prompt:** *How do you think your municipality would view a scheme such as this?*

## Appendix IV: Reflexivity Statement (Primary Researcher)

I am a white, female PhD student, aged 25, at the University of Nottingham School of Veterinary Medicine and Science. I grew up in London and attended state school until the age of 18. I started my veterinary degree at the University of Nottingham in 2017. My PhD is intercalated between the fourth and fifth years of my studies.

During the third year of my veterinary degree I was assigned to a project investigating the socioeconomic importance of working equids in Colombia. Prior to completion of this project, I had no knowledge of working equids or the communities in which they live and work. However, throughout this project, I developed a strong appreciation for the importance of working equids to the lives of their owners, and became aware of the plethora of welfare concerns within these populations. Having enjoyed the research process and content, I was able to complete a research placement with World Horse Welfare investigating working equid populations in Panama during my fourth year. This strengthened my interest in the subject area further. After completing the fourth year of my veterinary degree, I was able to intercalate and start an MRes, which was then extended into this PhD project.

I have ridden and worked at local riding schools since the age of 14 and have also had two horses on full loan and have since had a strong interest in equine welfare. Through my work at riding stables and caring for horses on my own I have developed an appreciation for the amount of care required and the vast number of challenges that are faced when owning and caring for horses. I feel that this increased my understanding of the external factors that need to be considered during equid ownership. However, I am unable to fully appreciate the additional challenges experienced by working equid owners.

Throughout the project I have visited some of the communities involved in the research project, which has helped massively with my understanding and appreciation for the context in which the data has been collected. During the

early stages of the project I had not visited any working equid communities, which may have influenced my interpretation of the data.

## Appendix V: Reflexivity Statement (Research Team)

### Reflexivity statement: Santiago Henao Villegas

#### Research staff from Universidad de CES

My name is Santiago Henao Villegas, I'm 51-year-old, Colombian, veterinary doctor with a master's degree in preventive medicine and PhD in Bioethics.

Much of my work activity has been carried out in veterinary schools in Medellin (Colombia). I was the dean of the veterinary faculty at CES for 11 years. After that I have been delving deeper into animal welfare with the poultry, pork and livestock production guild.

My line of research is animal ethics and animal welfare. Since 2019, I was asked to actively participate in a research project with working equids. I loved that idea considering that my grandfather was a mule owner all his life and I love that population. From the analysis of the human relation with equines, many dilemmas have arisen, related to the limits that we must establish in the tasks undertaken by horses, mules and donkeys. The objective assessment of welfare in horses, avoiding value judgments, is the challenge that I set for myself within the role that I occupy in these research projects.

When we started visiting the communities, in the initial project there were 9 different places in Colombia, it was a very positive experience, it was discovering the different uses they give to horses and understanding many cultural differences. Then we carried out a prioritization exercise, leaving 4 communities (Apartadó, Andes, Cocorná and Kütünsuma). In those places we began to carry out a series of visits, with positive impacting in each community where traditionally there is no support from animal health professionals. It was really a very nice experience to see behavioural changes in them, assuming more respectful roles with animals. However, it is clear that we continue to have important challenges, especially in some sustainable development goals, but our contribution has been very well valued for the

communities and for the working group it is to feel that we really comply in terms of social responsibility and socially useful research.

**Reflexivity statement: Carolina Jaramillo Gomez**

**Research staff from Fundación Arrieros Colombia**

I am a Veterinary Zootechnician from CES University in Medellin, Colombia. I am 32 years old, in 2010 I started my studies and from the beginning of my career I felt the need to take the knowledge I was acquiring to the field, where the people were who day by day depend on what they do with their animals, this is how I started managing a group of students called EquiCES where we periodically went to municipalities to do health brigades to evaluate how the horses were doing and how we could improve conditions. In 2018 I began working as an ally of World Horse Welfare, managing Fundación Arrieros Colombia, where we had the opportunity to carry out a research project together with the University of Nottingham, CES University and World Horse Welfare on the impact that the Covid-19 pandemic had caused. on the socioeconomic status of the owners and the well-being of their equids, from this research we were able to identify the different problems that the owners suffered with their equids, among them, the colic issue.

It was decided to begin an investigation into this very necessary issue that generates losses in the communities if it is not identified or managed in time.

This type of research manages to meet the goals of One Health and One Welfare, where balance is sought between animals, humans, and the environment. It is very satisfying after finishing the research to go back to the communities and listen to people mention what they learned during the research, what they have been able to improve and avoid so that their horse is in good condition, but always the same question, when We will return with another investigation, because with colic we do not solve all the needs, there are many topics in which we can continue researching and supporting the communities and thus ensure the food security of each family.

**Reflexivity statement: Sergio Andres Pizarro**

**Research staff from Fundación Arrieros Colombia**

My name is Sergio Pizarro, I live in the city of Medellin in the department of Antioquia, Colombia. I was born and raised in a district of the city called San Antonio de Prado, where I still live.

I am a zootechnician graduated from the University of Antioquia and I am currently studying a specialization in animal welfare and ethology at the University UNIAGRARIA. I have taken some courses and diplomas related to teaching and project management.

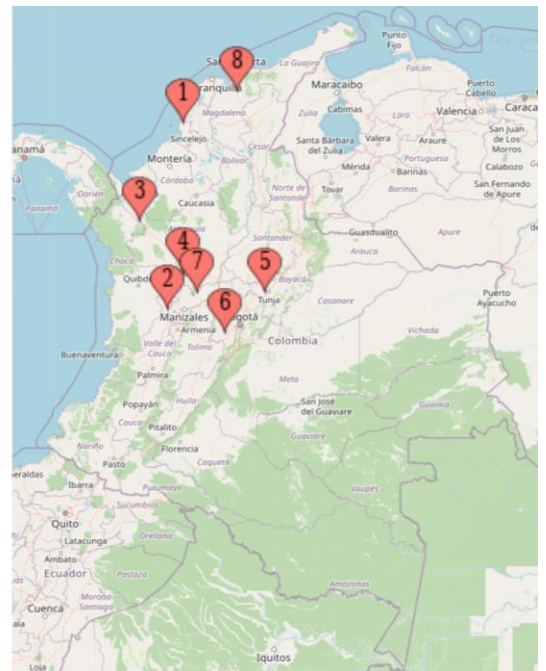
During my professional career I have had the opportunity to work in poultry farming, with small species and I have had the opportunity to accompany young and adult secondary school students in the natural sciences.

Currently I am working for the Arrieros Colombia Foundation coordinating the educational program, and in this way I can combine my love for equines as my passion for teaching, bringing to the different communities where we are present, tools that contribute to ensure the welfare of equines with sustainable development under the framework of One Health and One Welfare.

## Appendix VI: Community Profiles (Chapter Three)

### Community overviews

A total of twenty-four focus groups were carried out across eight regions in Colombia. Data was recorded in Spanish and subsequently translated into English by CES Universidad in Colombia. Participants were allocated to one of three groups: 'owners', 'leaders' or 'women' depending on their gender, their role within the community and their involvement with working equids. In Santa Marta focus groups were carried out with two different communities. A focus group with leadership figures was conducted in Kütünsuma, whilst focus groups with women and working equid owners was conducted in Machete Pelao.



### Cocorna

Cocorna is a town and municipality located in Antioquia, Colombia. It is around 90km South-East of Medellin and has an altitude of around 800-1400m. The challenging topography makes transport of materials into the region difficult. There are many rural towns within the municipality (estimated that around 80% of Cocorna is rural) with around 18,000



inhabitants and 64 hamlets. Cocorna relies on tourism and agricultural (panela and coffee) and livestock (cattle, fish, pigs and poultry) farming.

### **Physical environment**

Participants stated that the average temperature remains consistent throughout the year (daily mean temperature of 21-23°C) with the rainy season lasting from March to December. It was highlighted that the road quality varies throughout the region and that high rainfall worsens the road condition. Some rural villages are only accessible by equid, which can take up to 10 hours to reach. It was stated that there is good access to children's education and health services are available between most rural communities. Participants identified that most villages have access to internet, water (needs to be boiled before being consumed), electricity and human health care.

### **Social environment**

Participants suggested several associations present within Cocorna (Livestock Farmers Association, Panela Producers Association, Coffee federation, Fish farming association) and an animal protection programme aiming to reduce abuse in the area. It was also highlighted that there is an overall negative external perception of working equids within the region. Participants stated that most families in Cocorna have 3-4 children and both parents work, and that in rural areas, children start working around 11 years old and are involved in equid care. Participants stated that women work alongside men rurally and women living in urban areas have a lot of independence.

### **Perception on replacement scheme**

It was identified that coachmen within the region have already had equids replaced. Participants who still use equids expressed a fear of the replacement scheme and felt that this would not be functional due to the road quality. It was made clear that for muleteers, their equids are a means of making a living.

### **Impacts of covid**

Whilst some participants stated that there had not been much spread of covid-19 within Cocorna and that the pandemic had not had much impact; others highlighted the financial impact the pandemic has had with some families now living in extreme poverty with very precarious livelihoods. Participants also stated that there had been an increase in the number of children working due to covid; this was either young boys outside the house/ on farms or young girls helping with household chores.

### **Working equids in Cocorna**

Participants discussed the use and importance of working equids within Cocorna; stating that equids were used for transportation of foodstuff and other materials into the region due to challenging topography. Uses of equids also included crop transport, personal transport and use as an ambulance. Mules were described as being more intelligent, safer and better for trails; whereas, horses were highlighted as importance to be used in the main square for tourism. Participants were unclear of how many equids there are in Cocorna, but expressed the decreased need for working equids due to more recent improvement in road quality and an increased use of motorised vehicles. Participants suggested that muleteering is inherited, with information and care practices being passed down generations.

Owner perception of their equids varied between individuals with participants stating that some owners love their equids, whilst others think of equids as vehicles and as a result give their equids the bare minimum just so they are able to work. Participants discussed the care and management of working equids including frequent problems with shoeing, first aid, de-worming and vaccinations due to a lack of knowledge. It was also identified that there was no way for owners to seek support if there was an emergency involving their equid(s). In terms of stabling, participants stated that equids were usually kept in paddocks; however, there was some access to stables. Common health problems in working equid populations in Cocorna that were identified by participants were colic, ticks and lameness. Participants acknowledged the relationship between poor farriery practices and lameness. Participants

identified that there is a vet available in Cocorna and owners are able to contact if needed. However, this may be through a chain of people passing messages and that some owners will struggle to physically access a vet due to the distance needed to travel to go to Cocorna. Participants also identified the importance of agroveter stores, where a variety of veterinary drugs, horseshoes and tack is available to buy without prescription.

Participants stated that intentional abuse of working equids was more common at night; and was linked with alcohol consumption. It was identified that more regulations had recently been implemented to allow cases of abuse to be reported and allow for equids to be taken from their owners.

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**What support is wanted in Cocorna?**

Leaders	Owners	Women
Decentralisation of universities, training for leadership figures (what to do in cases of abuse-welfare linked to legislation), shoeing, owner training	Investment in tourism, road improvement, financial support, worming brigades, provision of saddles. Training on handling, shoeing and nutrition	Education and cultural support (e.g. that equids are sentient), raising awareness (theory of why things should be done differently) , work with younger generations

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**Andes**

Andes is a town and municipality located in Antioquia, Colombia. Andes is located between Jerico and Jardin (these are both cultural towns). The main economy in Andes is agriculture (coffee and plantain), mining and tourism. Participants highlighted a high rate of inequality and poverty within the region.

**Physical environment**

Participants discussed that the poor quality of roads in Andes make transportation of crops difficult. It was highlighted how the topography within the region means that there were some places where building roads would be impossible. Participants also identified that there had been some improvement in roads and as a result, some farms have less need for working equids. In terms of public services, participants stated that Andes has adequate water access and that there are sufficient chiva services. Chivas are also valued for their involvement in tourism.

### **Social environment**

Associations that were identified by participants included the Coffee growers foundation; Plantain growers foundation; 'one hectare for human development/ peace/ life' which provides people with coffee seeds, fertilisers and support; and SENA (National learning service) which offers students courses on coffee production. It was highlighted that there was a lack of external support from the administration, especially in regards to the quality of roads. The external perception of working equids was thought of as overall positive.

Participants discussed a large amount of involvement of women in administration, coffee harvest and avocado farming. The involvement of women in the care of working equids was also identified. Participants reported no cases of domestic violence or femicide in Andes.

### **Perception on replacement scheme**

Participants were resistant to the replacement scheme due to cultural, financial and practical concerns. It was made clear that equids are a reliable source of income and that *'Not to have horses in Andes would cause people to starve'- Woman from Andes*. It was also highlighted that motorised vehicles cannot go where mules can- *'that is why we have mules'- Andes owner*. However, participants stated that replacement might work well in urban areas.

### **Impacts of the Covid-19 pandemic**

Participants discussed the consequences of the Covid-19 pandemic within Andes; highlighting the lack of transportation, overload of work and an increase in input costs (cost of sustaining an equid doubled).

### **Working equids in Andes**

Participants felt that traditional culture has always been muleteers and that working equids are important in both rural and urban areas. However, it was also identified that many owners had replaced their equids with motorised vehicles now due to improved quality of roads along with the presence of coffee gathering company which further reduced the need for equids. Equids were reportedly used for personal transport (including transportation of children to school), carrying groceries and income generation through transportation of crops for market. The significance of these animals within Andes was highlighted, with participants stating that *'the mare is for everything'* and that equids are a *'member of the family'*.

Participants discussed that the care equids receive varies depending on the owner as they are the ones responsible for shoeing, deworming and general care of the equid. It was reported that men would work directly with the equids and the rest of the family would have some responsibility in the daily care of that equid. Participants stated that some owners did not invest much into their equids and cases of abuse and neglect were seen. On the other hand other owners would prioritise feeding and caring for their equids. The care of equids was perceived as being better in rural areas. Leaders from Andes viewed *'welfare problems are a result of ignorance'* and stated that some owners think equids only need food and water. The lack of knowledge held by owners was identified as a problem.

*'I want to make a parenthesis in relation to education with a very clear example... here, a horse falls down and can't get back on his feet and*

*everyone speculates...he got a heart attack...cut off his ear” that is what everybody does...they cut off the ear for blood circulation and the truth is that it works out.’- Andes leader*

Participants identified the availability of vets within Andes but highlighted the expectation that vets are only used to treat dogs and cats and that owners themselves are the ones expected to treat equids. Larger veterinary practices were identified in Medellin; however, the high cost of transport to Medellin was considered as a barrier for owners. Participants highlighted financial implications with many owners unable to afford veterinary services. Owners were also reported to request the cheapest treatments/ medications from agrovets. Whilst owners reported that agrovets store owners would advise them to buy most expensive medications as this would be more beneficial for them.

**Current and previous support available in Andes**

Participants reported good feedback from owners who had been involved in an Animal Welfare Day. Whereas, owners gave negative feedback in regards to administration de-worming brigades, stating that there was not enough wormers for everyone and so many owners stopped using this service.

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**What support is wanted in Andes?**

Leaders	Owners	Women
Training on animal welfare, animal welfare days, free services, big campaign with	Someone professional to go to for advice	Advice on animal care, financial support, animal

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support of CES to check condition of equids	health days (provision of training and equipment)
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### **Apartado**

Apartado is located close to the Panamanian border. During the civil war in the 90's, women took over care of working equids. There is still a large amount of female involvement in the care of these equids. Participants estimated that there is a population of around 200,000 with 30% living rurally. The main economy identified in Apartado was banana (and some cocoa) production.

### **Physical environment**

Participants stated that heavy rainfall can lead to worsening road quality along with flooding. Participants reported a large increase in poverty following flooding in 2019. Participants discussed current road development to increase links between Apartado and larger cities and universities. In terms of public services, participants felt there was sufficient access to electricity and drinking water. Participants also stated that a lack of job opportunities for individuals living in Apartado was a current problem being faced.

### **Social environment**

Participants discussed an overall negative perception of working equids, stating that people do not like seeing animal abuse; however, there is an appreciation for those who treat their equids well. A lack of police officers was identified; this was linked to a problem with abuse with individuals stating that nothing could be done in abuse cases unless there was a police officer present.

Participants stated that women are heavily involved in labour markets and children's education in Apartado, and that some banana companies have reached agreements to ensure a certain number of women are hired. Participants also highlighted some cases where women were victims of

violence. It was acknowledged that both women and children/ young people are involved in the care of working equids. Some owners perceived women to be better at handling and caring for horses than men.

### **Perception on the replacement scheme**

Participants were concerned with the financial implications that could result from the replacement scheme; both the cost this would require from the administration and the decreased income that owners may experience. Practical concerns were also noted, including the inability to remove material from rivers using a motorised vehicle. Participants also highlighted that many owners did not know how to drive or did not have the correct license and so would be unable to use any motorised vehicles. Participants concluded that the replacement may work for some, but would not be appropriate for everyone. Participants stated that *'whatever is well managed is good...if we organised and control the guild of coachmen and work for animal welfare, there would be no need for replacement'*.

*'People say they are abused...get rid of the horses...but they do not take into account that we are working'- Working equid owner from Apartado*

### **Working equids in Apartado**

Participants highlighted the use of equids to carry hardware inputs along with extraction of material from rivers, stating *'the municipality has been built with horses'*. Participants discussed how the care of working equids varies depending on individual owners; some treat their equids very badly, whilst others love and care for their equids well. Some equids were reported to be working without shoes, not being fed properly and living in dirty condition. An additional concern that was identified was equids being left to wander the streets, which would lead to accidents with cars and motorbikes. Participants identified some cases of intentional abuse where equids were beaten with



shovels or ropes. It was suggested that minors treat equids worse and that the pattern of abuse was passed down generation. Participants acknowledged that owners often do not have the economic resources to take their equid to the vet and that many owners do not use agrovet stores or do not buy any medications.

**Current and previous support available in Apartado**

Leaders reported that they were currently carrying out daily checks with the intent to avoid equid welfare problems and to identify anyone abusing their equid. Participants stated that previously, regulations have been implemented around working equid welfare; however, these rules were unclear and have many loopholes making it difficult to seize animals in cases of abuse. It was also concluded that previous attempts at training on animal welfare were unsuccessful. Leadership figures stated that there is a lack of resources (economic resources and appropriate spaces) to provide support and primary care to owners. Participants also stated that when trying to help, some owners become aggressive and insulting.

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**What support is wanted in Apartado?**

Leaders	Owners	Women
Training for owners that equids are sentient and on nutrition. Health care days.	Education on equids, sentient, care, not to abuse. Provision of stabling, health	Education for owners, training on basic care.
Implementation of penalties for equid abuse. Encouraging children to stay in education	brigades and veterinary access. Implementation of rules and penalties	Implementation of rules and penalties. Support for the administration to help organise owners and equids

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## **Cartagena**

Cartagena is a city on the Caribbean coast of Colombia. It is a 'traditional and cultural' city that relies heavily on tourism. There are high rates of inequality, unemployment and poverty within the city. It is estimated that around 274 families work with the mule carts and 120 with chariots- about 400 families make a living, directly or indirectly, from working equids in Cartagena.

### **Physical environment**

Participants described utilities (electricity, water and TV) as very deficient, and noted that the quality of these services was getting worse. Examples of this were cases of 18 hour blackouts and problems with contaminated water sources. It was also highlighted that the human health care system was deficient, this included a lack of equipment, long wait times, reduced prescriptions; and was leading to fatalities. Participants also stated that the road quality was a problem and that public transport did not cover all regions.

*'Nothing is in good condition...the city everyone wants to visit but in terms of utilities, we aren't where we should be'- Working equid owner from Cartagena*

### **Social environment**

Participants stated that only some children have access to education and that children are often involved in street vending, door to door selling and other forms of work. Women were reported to be housewives with a few working other jobs such as teaching; whilst men are involved in different activities with little income due to low academic level. The high levels of poverty and vulnerability of working equid owners in Cartagena was highlighted throughout focus groups. Participants stated that there was a high cost of living in Cartagena.

*'Working equid owners are the poorest of the poor' – Woman from Cartagena*

*'Here we are talking about 12 owners with the financial capacity to self-sustain in the event of a crisis...the rest, if I am not mistaken, are very vulnerable families and they are exploited as well as the horses, which is counterproductive' – Woman from Cartagena*

*'Some families struggle to eat'- Leader from Cartagena*

Participants also discussed the importance of family, particularly with equids; stating that families (including women) provide lots of support for the care of equids.

### **Impacts of the Covid-19 pandemic**

It was clear that the Covid-19 pandemic had major consequences within Cartagena; with participants discussing the financial implications caused by the lack of tourism; along with problems with human health care and problems associated with biosecurity due to limited access to water. A lack of support from the administration was identified by participants.

*'Surviving in the city is very hard'- Working equid owner from Cartagena*

### **Perception on the replacement scheme**

Owners expressed an overall fear of the replacement scheme, highlighting that this would not be functional due to the road quality and income generation equids are used for. Participants reported that some coachmen in Cartagena have already had their equids replaced with motorised vehicles through this scheme.

## **Working equids in Cartagena**

Participants stated that working equids are used by vulnerable families, with low educational levels. It was identified that the owner of the equid is not always the owner of the carts the equids pull. A reduced use of working equids due to an increased use of motorised vehicles was also reported.

Participants described how older coachmen are passing their carts and equids to Venezuelan immigrants who have no experience of equids or of the road rules in place in Cartagena.

Participants identified that the care of the equids was the responsibility of the owners and some owners took good care of their equids, whilst others did not. Problems associated with the care of equids that were identified included a lack of appropriate spaces to keep equids and poor owner knowledge.

However, participants did conclude that the care and welfare of equids had improved.

*'Before the horse used to look for its own food, now we feed them...things have been changing'- Working equid owner from Cartagena*

*'30 years ago a horse was like an object that didn't feel anything. Now, no...we know they are a living being that feels. We must love them, respect them. The love for the horses has changed 100%'- Working equid owner from Cartagena*

Participants from the women's focus group in Cartagena suggested that equids here were in very bad condition and that this was due to the care given by the owners.

*'Feeling sorry for them makes no sense, more than 12 people profit from this animal abuse'- Woman from Cartagena*

### **Current and previous support available in Cartagena**

Leaders in Cartagena recalled providing support in the form of monthly check-ups, animal welfare training, encephalitis vaccinations and deworming and vitamin days. Feedback from these services included a good response from owners. It was identified that owners have now been provided with stickers to place on their tourist carts. These state the maximum weight limit and take the pressure off owners having to determine and discuss this with tourists themselves.

The focus group carried out with women in Cartagena varied, with participants stating that the foundation they work with has previously tried to help but realised owners are very unstable and education doesn't work. Participants highlighted that the foundation works for animal welfare and does not take into consideration the owners livelihoods or welfare.

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### **What support is wanted in Cartagena?**

Leaders	Owners	Women
Free of charge services	Access to a vet to provide support incl. on nutrition. No association with UMATA. Training programme on general handling, health, wellbeing. Support to build stables. <i>'The more training we have, the more we will love our horses'- Owner</i>	Replacement is needed. Training and education for owners.

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## **Entrerrios**

Entrerrios is in the North-West of Colombia. It is described as the 'Colombian Switzerland' by participants due to its landscapes. There was a very positive outlook on the region across all focus groups. Entrerrios relies largely on the dairy industry along with some agriculture (avocado, berries, potatoes and beans), pig farming and tourism. Participants reported that there lots of employment opportunities within Entrerrios. Participants described the challenges that were currently being faced due to a decrease in the cost of dairy products. Leaders wanted to offer farmers feeding alternatives to reduce their input costs in an attempt to overcome the financial difficulties of this.

### **Physical environment:**

Participants referred to the access to and quality of utilities (including access to clean water and internet) very positively; this was also seen when discussing public transport and human health care. Participants stated that most farms now had road access and most families owned motorised vehicles; however, the quality of roads varied. It was noted that dairy and agricultural companies helped with the maintenance of roads.

### **Social environment**

Children's education was viewed as very important in Entrerrios with children being encouraged to study, with many wishing to continue onto college. However, the lack of opportunities to study at college level, especially for those living rurally was commented on. Participants reported that children living rurally would help on farms during their free time, and their love for equids was expressed from a young age. The role of women as both housewives or those working on farms was acknowledged.

### **Perception on the replacement scheme**

The replacement scheme currently refers to working equids who are used for transportation of materials or used to pull animal drawn vehicles. Participants

were aware that the replacement scheme would not apply in Entrerrios due to the nature of working equid work within the region. However, participants were able to acknowledge the problems that would be faced if they were required to replace their equids with motorised vehicles. The higher cost associated with motorised vehicles, along with the practicality of replacement were the biggest concerns. On the other hand, some participants felt that replacement of equids would have positive outcomes and would help to overcome the problem of equids being overloaded.

*'On a farm, a horse can't be replaced'- Working equid owner from Entrerrios*

### **Welfare of working equids**

The reported uses of equids included transport in farming (transportation of milk and wood) and recreation. It was highlighted that whilst these animals are still vital on some farms, there had been an overall decrease in the need for working equids. The care of equids was reported to vary depending on the owner; with some horses seen to be in very good condition and well cared for, whilst others are not fed or shod properly and are often overloaded by owners who perceive their equids as a vehicle. There was an overall view that owners are willing to spend money on their equid to a certain point (cost-benefit). Owners acknowledged the relationship between the care equids receive, the equids overall welfare/ condition and what they can endure (in terms of work). Participants felt that owners aren't always aware of the condition of their equids and lack knowledge around feeding and nutrition of equids. Common health problems identified in populations of working equids in Entrerrios included distemper, 'polvillo', lameness, parasites, dental problems and colic. Participants estimated that there are around 20 vets in the region but only a couple of them treat equids. Other than vets, participants identified other individuals who owners would go to for advice. It was unclear exactly who these individuals were but they were described as

using more empiric methods of treatment. Participants concluded that in most situations owners would attempt to treat the animal themselves, and only if this did not work, would they consider contacting a vet. The chain of knowledge transfer was identified as generational, with children learning about the care of equids through helping their parents.

**Current and previous support**

Support from administrations in Entrerrios was felt to be minimal with current training only available around worming and neutering of dogs and cats; this lack of support was attributed to a lack of knowledge held by leadership figures on the current situation with working equids. ‘Alpina’ was identified as national level support available to owners, but it was not discussed in any further detail.

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**What support is wanted in Entrerrios?**

Leaders	Owners	Women
Training for owners on welfare, nutrition, behaviour, basic care.	Training on oral and hoof health, nutrition, first aid, deworming, assessing equid condition, daily care,	Health brigades to check actual health of equids
Training for leaders so they can provide support to owners when needed (shoeing, lameness, reproduction, dentals)	vaccinations, shoeing. Equid health checks, technical assistance of farms. After 11am (after work)	

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**Villeta**

Villeta is located in Cundinamarca, close to Bogota. There are estimated to be around 25,000 inhabitants across 22 communities. Those living here have a very positive perception of Villeta, stating that it is a welcoming, friendly, safe



municipality. Most individuals living here work in tourism, construction, livestock production (cattle, pigs) or agriculture (panela, avocado, fruit, coffee). Previously panela production has been the main economy in Villeta but due to a decrease in panela prices, more people are moving towards tourism. Participants described the poor working conditions that are seen within the panela production industry.

### **Physical environment**

Participants stated that there is some access to water and electricity, however, it was highlighted that some poorer families are unable to access these services. Participants from the leaders focus group reported a well-equipped hospital in Villeta; however, owners felt that the human health care system was lacking both infrastructure and doctors. In terms of education, every rural community has access to a school and further education is available through SENA. Participants discussed the quality of roads in Villeta; leaders felt that the overall quality of roads was sufficient; whereas owners suggested that the roads were of poor quality due to the pandemic and the rain.

### **Social environment**

The positive external perception of working equids within Villeta was attributed to owners maintaining their equids in good condition. The number of children in each family in Villeta was reported to have reduced. The importance of children's education was identified by participants, with individuals stating that if children did not study, they would have difficulty getting a job. It was highlighted that children wanted to study and that there were opportunities for them to do so. Alongside education, participants reported children helping on farms and with working equids in their spare time.

The role of women in Villeta seemed to vary with participants reporting that some women helped with cooking for men working within panela production, others were involved in child care, farm work or work at home doing house

chores. It was also identified that some women are single mothers due to losing their husbands to armed conflict. The increasing equality of women was highlighted with participants stating that women and men are paid the same and that women have access to SENA.

### **Impacts of the Covid-19 pandemic**

Participants discussed the consequences of the pandemic; this included an increased rate of unemployment, reduced quality of life, increased human health problems, significant impacts on the tourism industry and worsening of road quality. The repercussions of the Covid-19 pandemic on working equid care and welfare were also discussed. Participants explained that owners could no longer afford to support equids (e.g. couldn't afford to feed them) and as a result equids were being sold or left in paddocks.

### **Perception on the replacement scheme**

Participants' views on the replacement of working equids with motorised vehicles varied; some owners were willing to consider replacement if it would improve their livelihoods; whilst others felt that this would not be practical due to topography, tourist preference and cultural practices. It was also highlighted that replacement would not be necessary if equids were maintained in good condition.

### **Working equids in Villeta**

Leaders in Villeta estimated that there were around 750 equids in the region. The importance of equids was highlighted in rural areas of Villeta, whilst it was identified that equids were not used in urban areas. Equids were reportedly used for transport, entertainment, tourism, farm work and panela production. Participants also expressed involvement of equids in tradition and culture, stating that equids are involved in a lot of festivities in the region, including the panela festival.

The care of equids was identified to vary depending on the individual owner with some perceiving equids as just a tool, whilst others loved their equids

and were aware of the importance of proper care. Problems with the management of equids that were identified included malnutrition, ill fitting tack and a lack of worming protocols. A lack of knowledge of equid nutrition was also identified as a problem in Villeta. Some participants reported that intentional abuse of equids was not seen. However, others stated that there were cases of abuse and discussed the relationship between abuse and alcohol consumption. Knowledge of equid care was described as generational, with women and children becoming increasingly involved. Participants acknowledged the role of women in the daily care of working equids with some participants suggesting that women were more gentle and provide better care for equids.

*'Let me tell you something... when I begin to shoe my horses and I am too rough... my wife interferes and scolds me... she is the number one advocate. '- Working equid owners from Villeta*

Common health problems were discussed during focus groups; health problems given by participants included lameness, parasites, nutritional problems, colic, hormiguillo, vesicular stomatitis , scabies and babesiosis. Participants suggested that some owners use veterinary professionals for advice and support, for example, if an equid is unwell, for worming protocols or for general health checks.

**Current and previous support available in Villeta**

Participants identified current support from 'Agro-Villeta' which promotes, disseminates and advertises different equid breeds and species.

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**What support is wanted in Villeta?**

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Leaders	Owners	Women
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Breeding programmes, alliances with CES/ Arrierosto educate owners. Education for owners on welfare, care, behaviour, hoof care, equids as sentient. Continued meetings to support leaders	Training on first aid, medication, shoeing, nutrition. Access to vet, education of children on equid care and management. Someone to call (over phone) to provide support/ advice	Training for owners on care of equids. For those working in tourism. Visit farms to provide training. External service providers wanted
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### **Santana**

Santana is located about 4 hours from Bogota, it is made up of a total of 7 communities/ hamlets. The main economy in Santana is agriculture (panela, coffee, cacao, citrus fruit, cassava, plantain, vegetables), along with some livestock farming (cows, pig, fish).

*'We are hard-working people, especially in the countryside... people in town are very kind and very helpful with visitors.'* - Leader from Santana

### **Physical environment**

Working equid owners held a positive perception on the quality of public services in the area. They felt that the human health care system was sufficient and the quality of roads was 'excellent'; however, there was some variability in road quality, with heavy rain worsening road conditions.

Participants from the women's focus group explained that individuals were required to pay for access to water but in some communities the water was yellow and dirty and could not be consumed even after being treated at home; this led to individuals having to travel to other local villages to collect water. Along with this, individuals would also pay for rubbish collection that

would not always actually happen, leading to a build up of rubbish in rural areas. Overall, participants felt that utilities were sufficient in urban areas, but those living rurally often experienced more problems.

*'In the urban area, they do have internet and in the countryside... only the ones who have money can have it' - Woman from Santana*

### **Social environment**

Associations discussed during focus groups included the Association for cacao growers and the Panela federation. Participants felt there was a lack of support from the administration, with the support that has been provided benefiting those who they felt did not need it.

The role of women in Santana was reported to mainly be housewives, whilst men usually worked on farms. However; some women worked other jobs such as those in human health care or in the production of sugar cane. Whilst it was identified that women are involved in the care of equids, they do not work directly with them. There was a perception that mules are too dangerous for women and children to work with. Regardless of this view, some children (boys) aged 12-15 were reported to own and work with mules. Rurally, children were encouraged to stay in agriculture, in urban areas, they were encouraged to stay in school. Participants stated that children's education up to high school is available (municipality subsidises transport to schools) but higher education beyond this is limited.

### **Impacts of Covid-19 pandemic**

Participants highlighted that many children started working during the pandemic and now don't want to go back to school. Additionally, problems with internet connection made it challenging for children to continue with virtual education. An increased cost of living was also highlighted as a consequence of the covid-19 pandemic.

### **Perception on replacement scheme**

The replacement of working equids with motorised vehicles in Santana was perceived as unsuitable and impractical. Concerns included increased rates of unemployment, practicality associated with the topography and cultural aspects of working equid ownership. Some owners reported having a motorised vehicle already but still requiring an equid for certain activities.

### **Working equids in Santana**

The main uses of equids were identified as transport for sugar cane and for personal transport. The use of equids was more important during the rainy season when the roads are worse. Participants suggested that the overall care of working equids had improved. Reports of the level of care an equid received were dependent on the owner themselves and the motivation behind their decisions. Some owners are proud to have equids in good condition, others care for their equids well as they were aware they had to in order to make a living, and others provided little to no care for their equids. Participants highlighted that during festivities in Santana, there were prizes awarded to those with equids in the best condition. Specific management practices were discussed in focus groups and included equids being fed by-products of sugar cane, hay grass and concentrates. Most farriery was reported to be done by the owners themselves. The care of the equids was also reliant on the individuals who rent equids to work (they do not own the equids but are responsible for their care whilst working). Participants stated that intentional abuse of equids has been common in previous years. Some participants stated that this kind of abuse was no longer seen, whilst others reported having witnessed cases where equids were intentionally abused by their owners.

*'... here because of the rain, the roads get bad, so the mules fall down and the owner begins to hit the animal with a cane or with a whip'- Leader from Santana*

Common health problems that were reported by owners included colic, skin problems and lameness. Treatment methods described included a mixture of veterinary and home-made products. Other problems that were highlighted by owners included older equids still being worked; and accidents occurring between equids and motorised vehicles.

**Current and previous support available in Santana**

Owners described previous support from UMATA in the form of health brigade on Sundays (chosen as this is the day most equids are not working) during which equids received wormers and vitamins. The appreciation from owners for these days was recognised. Participants also mentioned previous support from ICA (Colombian Agricultural Institute), who provided health care training for muleteers.

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**What support is wanted in Santana?**

Leaders	Owners	Women
Development of associations, technical assistance, education for owners- nutrition, welfare, abuse. External support, in person. Enforcement of laws on abuse	Provision of stables, training on nutrition, care, first aid, health. Done on working days	Provision of a vet, training for owners- what to do when vet isn't available

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**Santa Marta- Kütünsuma**

Kütünsuma is an indigenous community located on the Caribbean coast. There are four indigenous tribes located in the northern part of Colombia, these are: Arhuaco, Wiwas, Kogis, Kankuamos. Those living in Kütünsuma are part of the Arhuacos. Families here live on the crops they grow. There is some

income generation from selling traditionally made rucksacks. There was only one focus group carried out in Kütünsuma, with leadership figures. This focus group was carried out at a meeting point where families would gather for meetings, children's education and human health visits.

### **Physical and social environment**

Participants reported that there were around 5 school centres with around 600 students. However, it was highlighted that not all children go to school. Individuals in Kütünsuma perceived learning western knowledge to be unimportant, and education focused more on children learning about their own identity. Children's education was reported to finish at 11 years old, and as a result those who want to go on to study at university often struggle due to a lack of knowledge. Participants highlighted that some universities offer special places to those from an indigenous community. Participants stated that access to human health care was often challenging and that whilst some medications were available in the community, they often expired before being used up.

Participants reported that most women in Kütünsuma are housewives, with a small number of women working in children's education or human health care. The development of a new women's association was highlighted, that supported selling of hand-made rucksacks.

### **Perception of the replacement scheme**

It was made clear that mules were much more beneficial than motorised vehicles and that the roads would need to be improved if the replacement was to occur.

### **Working equids in Katanzama**

Participants acknowledged the importance of working equids for personal transport, and commented that it is very uncommon for a family to not have a working equid. Participants described how owners would only consider vaccinating equids when they have lots of equids dying. It was also identified



that equids were often not shod. Most mules were reported to be bred within the communities, and a small number purchased from elsewhere. Common equid health problems that were a concern within Kütünsuma included colic and 'hormiguillo'. The treatment methods used were often home-made empiric treatment options that were passed down through generations.

### **Santa Marta- Machete Pelao**

Machete Pelao is on the north coast of Colombia. It is found on the route to 'Cuidad Perdida'. Individuals here work and live alongside the indigenous communities. The main economy in Machete Pelao is tourism; this includes people working as muleteers, cooks and guides for tourists. There is also a small amount of agriculture; however, there is little profit in this due to high transportation costs to Santa Marta, as a result many people involved in agriculture grow crops for their own consumption or to sell locally. Two focus groups were carried out in Machete Pelao, one with owners and one with women.

### **Physical environment**

Participants identified a lack of human health care, describing a health care post that was available but highlighting that this was not enough as medication was often unavailable and it was challenging to transport patients to Santa Marta if they required further medical assistance. In terms of utilities, participants stated that the community had access to water via an aqueduct and from springs on farms. It was also identified that participants had access to electricity and satellite internet; however the internet was expensive and so not everyone was able to use it. The road quality in Machete Pelao varied, with good road access to Santa Marta but little to no road access to other regions in the area. Participants highlighted that heavy rain would worsen roads and overflow rivers and streams to the point where even equids were unable to cross. Participants also highlighted problems with rubbish disposal within the area.

*'We need everything... roads... we have a very open road, not paved... the electric infrastructure is very bad, there is no permanent service... if there is a damage... for example, I took a course on basic electricity... we ourselves have to fix it, because of the difficult access to the area... the companies don't come... also in terms of education, there are teachers and dormitories for the children, but it still lacks infrastructure... in respect to internet, we don't have access to [internet]'* – Working equid owner from Machete Pelao

### **Social environment**

The only association identified by participants was Asomula (Association for muleteers) that encourages muleteer culture. Participants discussed family dynamics and acknowledged the role women play in cooking for tourists, along with the help provided by children with mules and on farms. It was highlighted that the whole family helped with the care of working equids.

### **Impacts of Covid-19 pandemic**

Machete Pelao relies heavily on tourism and the consequences of the pandemic in the tourist sector were significant. Participants discussed how this had left them with no income, forcing them to rely on small one off jobs to get by. Participants reported that whilst those working in agriculture were less affected by the pandemic, many had been left unable to transport any crops to Santa Marta. Children were also affected, with education moving online. Some families reported being unable to access the internet and as a result children's education suffered. Whilst the consequences on the pandemic were made clear, it was also highlighted that equids had been able to rest for a long period of time due to the lack of tourism. Some participants also identified support available from the mayor's office in the form of groceries.

### **Perception on replacement scheme**

Participants were resistant to the replacement of equids with the practical issue of physical access being highlighted, along with the love for equids. Participants explained how some people living in the community prefer to travel by equids even if it is possible to go by car.

### **Working equids in Machete Pelao**

Working equids were identified as important for transportation of crops and livestock, personal transport and tourism. Work with equids is thought of as very cultural. Participants discussed a preference to mules, as they are more durable and live longer; but are more stubborn. It was highlighted that the muleteer (individual who takes a mule along a trail) is not always the owner of the mule, but does play an important role in the equid life. Participants highlighted that owners often treat the equids better than muleteers do.

*'Without mules...we are nothing'- Working equid owner from Machete Pelao*

The care of working equids was believed to reflect the motivation of the owners, some owners were described to care for their equids simply because they knew they needed the equid for income generation, others were very grateful for their equids and felt they owed it to the equids to take good care of them.

*'There are muleteers who care for them... they love them very much and there are muleteers who don't pay much attention to them... they love them because they know that they can eat because of them.'*- Working equid owner from Machete Pelao

Various aspects of equid management were discussed. Participants highlighted farriery practices, with owners often shoeing their own equids

and some owners bringing spare shoes when working their equids just in case. Participants also mentioned that owners will buy medications for their equids if they can afford it; otherwise they will use home remedies. Financial implications were also reflected in feeding practices, with equids not always fed well as grazing is poor in dry season and owners cannot afford to supplement the equids diet. This problem was exacerbated as a result of the Covid-19 pandemic.

Participants identified common equid health problems that are seen within the working equid population in Machete Pelao. These included lameness and colic. Treatment methods reported for these included bleach, battery acid, ACPM and ivermectin to treat lameness and buscopan, urine, beer and salt to treat colic.

The extent of intentional abuse of working equids was unclear, with some participants stating that mistreatment of equids did not occur. Owners stated that *'... there are mules that must be grounded because they are rebellious and kick, but other than that, you don't hit them... and the mule knows who the master is...'* - Working equid owner from Machete Pelao.

*'Sometimes, animals are rebellious and make us angry, but not to the point of mistreating animals.'* - woman from Machete Pelao

Knowledge of equid care and management was suggested to be passed down generationally, through children watching their parents. It was also highlighted that owners would seek support from individuals who had more experience with equids when needed.

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**What support is wanted?**

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Owners

Women

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Guidance on care, vitamins, worming, vaccinations.	Training for owners, treatment of health conditions. Training on making
Training, little of everything.	equipment. Work in groups. For women and men. Veterinary training for local
Training on cattle.	individual

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## Appendix VII: Baseline Colic Survey (Chapter Four)

# 1. Understanding the problems associated with colic in working equid populations in Colombia

This survey forms part of a larger project looking at colic in working equid communities across Colombia. This survey focuses on the identification, management, and consequences of colic, along with exploring current management practices used by working equid owners. This research aims to provide information that will help with the development of educational programmes within these communities.

### 1. Participant Consent\*:

- I have read/listened to the Participant Information
- I understand the purpose of the research
- I understand I may stop the interview at any point
- I understand that my personal information will not be shared at any point
- I understand that the information collected will only be accessed by researchers at The University of Nottingham and World Horse Welfare
- I understand data collected from this survey may be published
- I understand I can contact the researchers/organisations if I have any questions
- I confirm that I am over 18 years of age

I consent to taking part in this survey. \*

Yes

## 2. Demographics

### 2. Community

Apartado

Andes

Cocorna

Santa Marta

3. Participant gender

Male

Female

4. Participant age

5. What role do you have in the management of equids?

Own my own equid(s)

Rent equids to work with

Don't own my own equid(s) but am involved in caring for other peoples equids

Other (please specify):

6. How many years of experience do you have owning/ working with equids?

7. How many equids do you own?

Horses

Donkeys

Mules

8. What type of work is your equid used for?

Brick Kiln work

Ranching/ Herding

- Ploughing
- Tourism
- Racing
- Crop transport
- Family transport
- People transport (not family)
- Water transport
- Material transport
- Waste transport
- Firewood/ wood transport
- Fish transport
- Scrap metal transport/ collection
- Other (please specify):  

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### 3. Knowledge and perception of colic

9. How many times in the past 12 months have you experienced colic with any of your equids?

10. If you have experienced an equid/ equids with colic, how often did they survive?

- I have not experienced an equid with colic



- Never
- Rarely
- Sometimes
- Always

Comments:

11. If your equid(s) did not survive, what happened to them?

- Died (before or without treatment)
- Died (during or after treatment)
- Euthanasia
- Other (please specify):

12. On a scale of 0-5 how painful is colic for your equid(s), with 0 being no pain and 5 being very painful?

13. Is there a time of year when colic is more common?

- Yes
- No
- Don't know

14. If there is time of year when colic is more common, when? and why?

15. On a scale of 0-5 how much does colic concern/ worry you, with 0 being no concern and 5 being very concerned?

16. On a scale of 0-5 how confident at dealing with colic are you, with 0 being not confident at all and 5 being very confident?

17. What signs of colic do you know? \*\*\*\*DO NOT READ OWNERS THE ANSWER OPTIONS, SELECT ANY THAT ARE GIVEN AND WRITE ANY ADDITIONAL SIGNS GIVEN IN 'OTHER'

- None
- Restless or agitated
- Lie down
- Rolling
- Sweating
- Walking/ circling
- Eating less or nothing
- Pass less or no droppings
- Changes in consistency of droppings
- Flank watching/ looking at abdomen
- Pawing ground
- Kicking at belly
- Rapid breathing

- Lowered head position
- Dull and depressed
- Tears/ crying
- Other (please specify): \_\_\_\_\_

18. What causes/ risk factors associated with colic do you know? \*\*\*\*\*DO NOT READ OWNERS THE ANSWER OPTIONS, SELECT ANY THAT ARE GIVEN AND WRITE ANY ADDITIONAL RISK FACTORS GIVEN IN 'OTHER'

- None
- Sudden changes in diet
- Not enough forage
- Too much concentrate
- Feeding inappropriate feed
- Ingestion of contaminated feed
- Ingestion of toxins
- Large volumes of feed at once
- Grass cuttings
- Changes in hydration status of equid
- Contaminated water
- Silty water
- Ingestion of sand and dirt
- Internal parasitic infection

- Dental problems
- Changes in grass quality
- Management changes
- Ingestion of straw
- Changes in workload
- Feed or water given immediately before exercise
- Feed or water given immediately after exercise
- Stress
- Other (please specify):  

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19. What treatment methods would you use if your equid had colic? \*\*\*\*\*DO NOT READ OWNERS THE ANSWER OPTIONS, SELECT ANY THAT ARE GIVEN AND WRITE ANY ADDITIONAL TREATMENT METHODS GIVEN IN 'OTHER'

- None
- Rest equid
- Walk equid
- Beer
- Salt
- Urine
- Petrol
- Cooking oil
- Avocado

Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

## 4. Current management practices

20. How many hours a day is your equid able to graze?

21. Is your equid given any other feed in addition to grazing?

Yes

No

22. What type of feed (other than grass) is your equid given?

\_\_\_\_\_

23. How often is your equid given feed (other than grazing/ grass)?

Never

Less than once a day

1-2 times a day

Freely accessible when not working

Freely accessible when working and not working

Don't know

Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

24. Do you ever change the type of feed your equid is given?

Yes

No

25. How often does your equid have access to water?

Never

Less than once a day

1-2 times a day

2-5 times a day

Freely accessible when not working only

Freely accessible when working only

Freely accessible when working AND not working

Don't know

Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

26. How soon before working is your equid fed (not including grazing/ grass)?

Immediately

Less than 10 minutes

10-30 minutes

30- 60 minutes

Over 1 hour

My equid is not fed before work

Don't know

Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

27. How soon after working is your equid fed (not including grazing/ grass)?

- Immediately
- Less than 10 minutes
- 10-30 minutes
- 30- 60 minutes
- Over 1 hour
- My equid is not fed after work
- Don't know
- Other (please specify):  

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28. How soon after work is you equid offered water?

- Immediately
- Less than 10 minutes
- 10-30 minutes
- 30- 60 minutes
- Over 1 hour
- My equid is not offered water after work
- Don't know
- Other (please specify):  

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29. Is it likely that your equid has access to rubbish or other non-food items that they may consume?

- Yes
- No
- Don't know

30. How many hours a day does your equid work?

31. How many days a week does your equid work per week?

32. Does your equids workload change at all throughout the year?

- Yes
- No

33. If your equids workload changes, why?

My equids workload does not change

Seasonal changes

Harvest

Changes in demand

Changes in owners routine

Other (please specify):

34. How often do you de-worm your equid?

Once a week

Once a month

Quarterly



- Biannually
- Annually
- Less than once a year
- Never
- Don't know
- Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

35. How often do you check your equids teeth?

- Once a week
- Once a month
- Quarterly
- Biannually
- Annually
- Less than once a year
- Never
- Don't know
- Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

36. Where is your equid kept when it is not working?

- Loose/ roaming
- Stable

Shed

Tethered/ tied up

In a field with fence

Other (please specify): \_\_\_\_\_  
\_\_\_\_\_

37. Any other comments/ questions

## Appendix VIII: Focus Group Schedule (Chapter Five)

**Section A: Information on the community** (location, facilities, access to resources, role of community members, information spread) – These questions can be specific to each participant (what is *your* equid used for?) or more general (what are equids in Andes used for?)

- What is it like living in (region)?
- *What are the benefits/ challenges of living in (region)?*
- *How would you describe the facilities in (region)?*
- *What educational opportunities are there, e.g. school, university?*
- *Who lives in your community?*
- Can you describe what day to day life is like for those living in (region)?
- How would you access information on....?
- Who are your important stakeholders e.g. when something happens?
- *Who can/ do you go to if something goes wrong in your community?*

**Section B: Use and care of working equids** (equid use, management decisions, stabling, feeding/ diet- some of this will be done through observation studies)

- What are equids used for in (region)?
- What is the daily routine for your equid?
- *Where are equids kept when they are not working?*
- *What/ when do you feed your equid?*
- How did you learn about caring for your equid?
- *Who would you go to if you had questions about the health of your equid?*
- What are your biggest health concerns relating to your equid?
- How easy is it to access a vet, farrier etc?

**Section C: Colic** (knowledge identification, prevention, treatment, consequences)

- What does the term colic mean to you?
- What signs would make you think your horse had colic/ how would you recognise if your equid had colic?
- What do you think causes colic?
- How would you treat a horse with colic?
- *What is your initial response to an equid showing signs of colic?*

- Do you feel there is enough support for owners of horses with colic?
- Does colic concern/ worry you?
- What are the consequences of your equid getting colic (for you and your equid)?
- What experience of colic have you had? What did you do etc?
- Is there any differences with donkeys, mules, horses?
- Time/ season of year where colic is more common?
- Would you feel confident dealing with an equid with colic?
- Would you be interested in training on colic, what format/ topics?

## Appendix IX: Consent Form for Workshop (Chapter Five)

### INFORMED CONSENT

**RESEARCH PROJECT:** Education as a prevention strategy for the treatment of colic in working equids.

**RESPONSIBLE RESEARCHER AND INSTITUTION:** Santiago Henao Villegas, MV, MSc, PhD (Co-investigator) Universidad CES.

#### **WHICH PROCEDURE WILL YOU PARTICIPATE IN DURING THE STUDY?**

If you agree to be part of this study, you will be asked basic questions and information about your social and economic conditions. All information Will be handled with strict confidentiality and questions should not be sensitive.

#### **Authorisation for the use of image rights on photographs and audiovisual productions (videos) and intellectual property rights granted to the group of researchers.**

By means of this form, I authorise the CES University research group to use and process my image rights to include them in photographs and audiovisual productions (videos), as well as copyright, related rights and in general, all intellectual property rights related to image rights. This authorisation shall be governed by the applicable legal regulations and may be used for educational and informative purposes in different scenarios and platforms. This video/ photo is non-profit and Will not be used for any other purpose at any time. This authorisation has no specific geographical scope, so the images in which it appears may be used in the territory of the world, nor does it have any time limit for its concesión, nor for the exploitation of the images, or part of them, so my authorisation is considered granted for an unlimited period of time.

#### **In case of doubts, complaints, claims, suggestions, who can ou contact ?**

Santiago Henao Villegas can be contacted by telephone at 3235782533, or via institutional email: [shenao@ces.edu.co](mailto:shenao@ces.edu.co) . Also through the CES University telephone (+574) 4440555.

By signing this consent form, you certify that you have been clearly informed of the purpose of the research, as well as the risks, benefits, data management and costs. You further certify that you agree to your participation.

- I confirm that I am over 18 years of age
- I understand that I am not obliged to give consent and I may withdraw my participation at any point of the process
- I understand that my contribution to the study will be recorded and used for research purposes
- I understand that the research from this study may be presented at research conferences or meetings

For the record, this is signed on the \_\_\_\_\_ day of the month \_\_\_\_\_, \_\_\_\_\_.

**Participant**

**Responsible Researcher**

**Witness 1**

**Witness 2**

\*A duplicate is given to the subject of the investigation

## Appendix X: Facilitator Guide (Chapter Five)

### 9 Facilitator notes

Before starting focus groups, please ensure ALL participants have understood and signed consent forms!

Date: .....

Time: .....

Community: .....

### 10 Introduction to project

Thank you all for your time, we really appreciate you all being here. The information we will be collecting today is part of a longer term project with Fundacion Arrieros, CES University, World Horse Welfare and The University of Nottingham. We want to help improve your daily lives along with the welfare of your equids and during this project we will be focusing on colic. We will be visiting you today and then we will come back for another two visit at the start of next year. Today we will go through two focus group sessions and then we have a short survey for you to complete, which will expand on what we discussed during our previous visit. The first of our focus groups will focus on the problems that can lead to colic and some of the current management and care of your equids. The second focus group will ask about some of your needs as owners. The more information you can give us in response to each question, the better and if you have any questions at any point, please let us know.

### 11 Questions (and prompts)

Please ask all major questions and encourage participants to discuss them in detail. Further prompts are given next to each question and can be used if they are needed. These prompts can be asked if the group does not cover these themselves or if the group is struggling to form a discussion. As you work through each main question, ensure that you tick the 'completed' box.

12 Focus group 1

13  Focus group 1 introduction

During our last visit we asked what you thought the causes and risk factors of colic were in your equids. Your community identified four problems. We now want to go through each of these in a bit more detail.

14 Section 1

	<i>Question (MUST ask)</i>	<i>Prompts (only ask if needed)</i>	<i>Completed?</i>
Q1a	We will start with Nutrition. So, how do you think your equids nutrition and diet influence colic?	<p><i>How does the type of feed you give your equid influence the risk of colic?</i></p> <p><i>Are there any specific foods that give your equid colic?</i></p> <p><i>Does the time of the day/volume/ way you feed your equid influence how likely it is to colic?</i></p>	
Q1b	What about the access and quality of water, how do you think this influences colic?	<p><i>Is water important to an equids digestion process?</i></p> <p><i>Does the volume/ source/frequency of water you give your equid change how likely your equid is to get colic?</i></p>	
Q1c	What about your equids workload, how do you think this influences colic?	<p><i>Are there any specific jobs/ types of work that make your equid more likely to colic?</i></p> <p><i>Does the amount of time you work your equid for at once influence colic?</i></p>	
Q1d	What about deworming, how do you think this influences colic?	<p><i>Do you think parasites/ worms can cause colic?</i></p> <p><i>Do you think worming your equid reduces the colic risk?</i></p> <p><i>Do you think the frequency that you worm your equid influences how likely they are to get colic?</i></p>	
Q1e	Do you think there is anything else that causes colic?	<p><i>Have you seen anything else causing colic in horses?</i></p> <p><i>Are the causes of colic always the same?</i></p>	

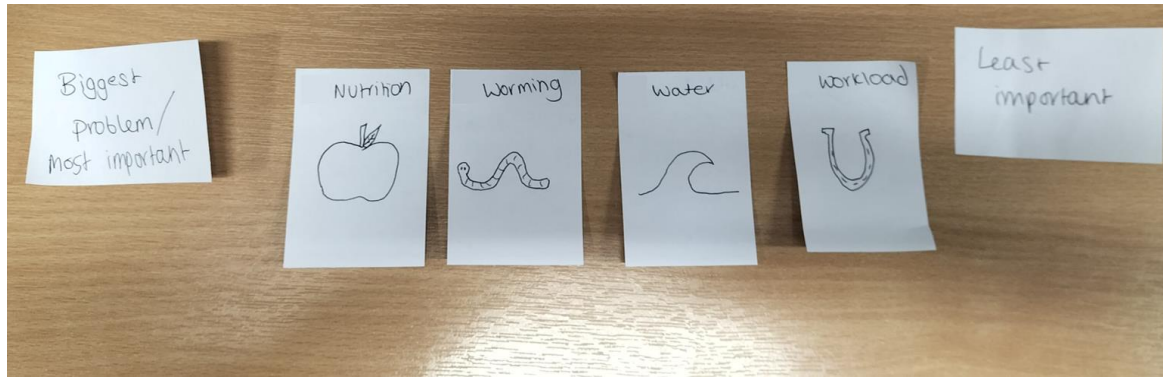


15 Section 2

Please provide each participant with 4 post-it notes and a pen. Ask each participants to use the pot-it notes to write each problem covered in the previous question (nutrition, water, workload and worming). Any other problems that were discussed in Q1e can also be written on post it notes. Each post-it note should contain one written problem and a symbol to indicate the problem (this is particularly important if any participants are not comfortable with reading). Use a post-it note or piece of paper write ‘most important’ and ‘least important’ and place these at opposite ends of a table/ wall/ chair/ floor. Encourage participants to place their post it notes between ‘most important’ and ‘least important’ depending on how they feel each problem should be ranked. Please take a clear photo of this once all participants are happy with this. Once this is done, write down the problem that appears to be most important- if this is not obvious, ask the participants to discuss and agree on which of these is the important problem is in their community.

	<i>Question (MUST ask)</i>	<i>Prompts (only ask if needed)</i>	<i>Completed?</i>
Q2	Using the post-it notes, please rank each problem them from most important/ biggest problem relating to colic to least important.	<p><i>Which of the problems we have just discussed is most likely to cause colic?</i></p> <p><i>What is the biggest cause of colic within your community?</i></p> <p><i>Does everyone agree with this order?</i></p>	

What was the biggest risk factor/ problem identified by this community (ranked as most important): .....



16 Section 3

During the previous section, participants should have identified what they think is the biggest problem in relation to colic in their community, please use this problem throughout this section- this may vary between communities.

	<i>Question (MUST ask)</i>	<i>Prompts (only ask if needed)</i>	<i>Completed?</i>
Q3	In terms of _____, what do you currently do and why?	<i>What is your equids daily/ weekly routine in regards to _____?</i> <i>Is this the same for everyone in your community?</i> <i>Does your equids daily routine ever change?</i> <i>If your equids routine does change, how often and why?</i> <i>How did you learn/ decide to do this?</i> <i>Who do you go to/ ask if you are unsure of something equid related?</i>	
Q4	Do you think current management practices in relation to _____ is a problem, and if so, why?	<i>Can you think of any ways to improve your current management practices?</i> <i>Is there anything you would do differently if you could?</i> <i>How do you think your management compares to others?</i>	
Q5	What challenges would you face if you tried to change your current management techniques?	<i>If there is anything you would like to change, what are the current barriers to this?</i> <i>What problems make it more difficult to care for your equid?</i> <i>What things do you need to consider when deciding how to care for your equid?</i> <i>Do other people in your community/ other communities also experience these challenges?</i>	
Q6	How do you think these challenges could be reduced or overcome?	<i>Is it possible to overcome these problems?</i> <i>Who needs to help you to overcome these barriers?</i>	

17. Focus group 2

During the previous focus group, participants should have identified what they think is the biggest problem in relation to colic in their community, please use this problem during Q1- this may vary between communities. For question 2, please provide participants with the printed examples of resources.

18.  Focus group 2 introduction

We now want to discuss what you would like to learn and how we can make sure that our future visits can be better suited to you and others in your community.

	<i>Question (MUST ask)</i>	<i>Prompts (only ask if needed)</i>	<i>Completed?</i>
Q1	You identified _____ as the biggest problem(s) associated with colic in your community, in relation to this, what would you like/ feel you need to learn?		
Q2	How would you like to learn about this? Please look through the resources given and discuss which of these you would find beneficial. Please add any other ideas you think would be more helpful.		
Q3	How can we make sure this project will benefit you and your equid?	<i>What barriers do you think there might be when providing you with this information?</i>	
Q4	Do you have any other questions or comments?		

# **Working Equids Colic Project**

## **Visit Two: Guide for Facilitators**

**Record of Community Visits**

Please use this section to record dates of community visits and which facilitators attended.

Date	Community	Facilitators

**Using this guide:**



- **Tick boxes** are used to highlight questions and content that must be covered - please tick these as you go along to ensure you haven't missed anything that is needed.
- **Facilitator questions** MUST be asked, **prompt questions** can be used to aid discussion but do not need to be used.
- Space for **notetaking** – please use these spaces to record anything you feel is useful to remember (e.g., important points, feedback, questions)

**Community checklist**

Use this space to tick off each activity as it is completed.

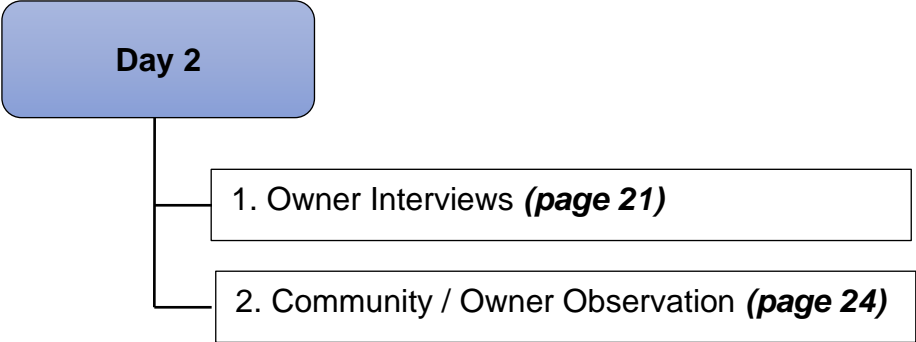
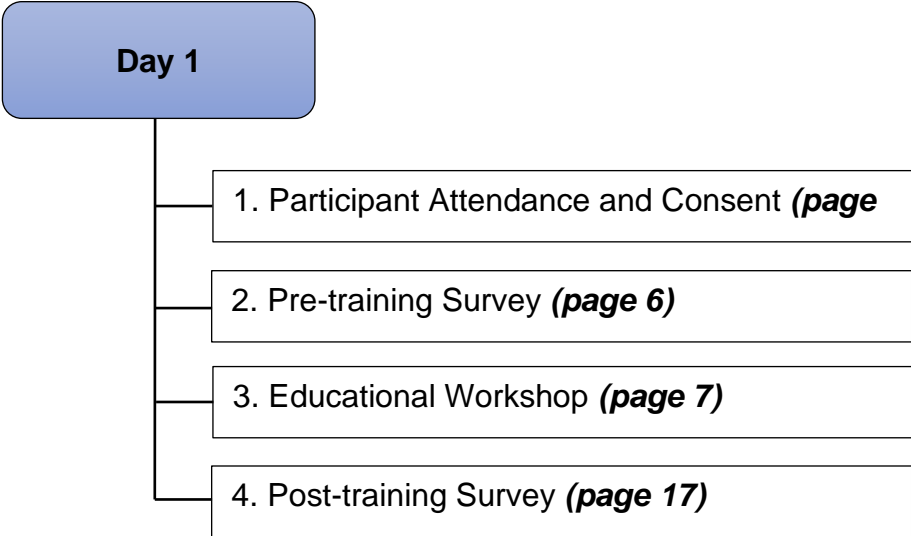
	PAGE NUMBER	SANTA MARTA	COCORNA	ANDES	APARTADO
<b>DAY 1</b>					
<b>ATTENDANCE FORM</b>	4				
<b>CONSENT FORMS</b>	4				
<b>PRE-TRAINING SURVEY</b>	6				
<b>COLIC INTRODUCTION</b>	8				
<b>COLIC SIGNS ACTIVITY</b>	10				
<b>NUTRITION ACTIVITY</b>	12				
<b>OBJECTIVE DEVELOPMENT</b>	14				

<b>PARTICIPANTS IDENTIFIED FOR CASE STUDY VISIT</b>	16
<b>POST-TRAINING SURVEY</b>	17
<b>DAY 2</b>	
<b>CASE STUDY CONSENT</b>	20
<b>OWNER INTERVIEWS</b>	21
<b>OBSERVATIONS</b>	24



**Overview of Visit Activities**

Each community visit will be carried out over a **two-day period**. The image below shows all activities and tasks that **must** be completed for each community visit. There is a checklist for each community on **page 2**. For more detailed guidance on each activity / task, please see the corresponding page within this guide.



## **1. Attendance and consent**

### **Materials needed:**

- Attendance sheet
- Consent forms
- Pens

### **Step One:**

Before starting any activities, please ensure all participants have been written down on the attendance sheet. If they would like to be contacted about the final visit (in May this year), they should also provide a contact number.

The attendance sheet will be numbered, so that each participant name will be written next to a number – this will be used as a unique participant ID throughout the study. This number should be written on all surveys completed by that individual.

### **Step Two:**

All participants **must** complete a consent form to continue with the activities. Please keep completed forms safe after completion.

**Visit 2- Participant attendance form**

Community: \_\_\_\_\_  
Date: \_\_\_\_\_

Make sure each participant writes their participant number and community at the top of their surveys

Participant number	Participant name	Contact number	Consent form completed?
1			
2			
3			
4			
5			
6			
7			
8			

**CONSENTIMIENTO INFORMADO**

**PROYECTO DE INVESTIGACIÓN:** Educación como estrategia de prevención para el tratamiento del cólico en équidos de trabajo.

**INVESTIGADOR RESPONSABLE E INSTITUCIÓN A LA CUAL PERTENECE:** Santiago Henao Villegas, MV, MSc, PhD (Co-Investigador) Universidad CES.

**¿EN QUÉ PROCEDIMIENTO PARTICIPARÁ DURANTE EL ESTUDIO?**  
Si usted acepta ser parte de este estudio, se le realizarán preguntas básicas e información sobre sus condiciones sociales y económicas. Toda la información se manejará con estricta confidencialidad y las preguntas no deben generar sensibilidad alguna.

**¿En caso de dudas, quejas, reclamos, sugerencias, con quién se puede comunicar?**  
Se podrá comunicar con Santiago Henao Villegas al teléfono 3235782533, a través de correo electrónico institucional: [shenao@ces.edu.co](mailto:shenao@ces.edu.co) . De igual manera a través de la Universidad CES, teléfono (+57604) 4440555

Con la firma del presente consentimiento, usted certifica que se le ha informado de manera clara el objetivo de la investigación, así como los riesgos, beneficios, manejo de la información y costos. Certifica además que acepta su participación.

- Confirmando que soy mayor de 18 años
- Entiendo que no estoy obligado/a a dar mi consentimiento y que puedo retirar mi participación en cualquier momento del proceso
- Entiendo que mi contribución al estudio será grabado y utilizado con fines de investigación
- Entiendo que la investigación de este estudio puede ser presentado en conferencias y en reuniones de la investigación

Para constancia, se firma a los \_\_\_\_ días, del mes de \_\_\_\_\_, de \_\_\_\_\_.

<b>Participante</b>	<b>Investigador Responsable</b>
<b>Testigo 1</b>	<b>Testigo 2</b>

\*Se entrega un duplicado al sujeto de investigación

Notes:

## Pre-training survey

### Materials needed:

- Attendance sheet
- Pre-training survey
- Pens

All participants should now complete the pre-training survey. **Please ensure their participant number is written at the top.** Participants can either complete this on their own or with help from facilitators.



The post-training survey will be **attached to** of the pre-training survey. Owners should keep these sheets with them for the duration of the activities. Once both surveys have been completed, owners should hand this into facilitators at the end of the session.

## **2. Education delivery**

### **Materials needed:**

- Colic sign cards
- Happy/ sad equid poster
- Leaflet
- Pens
- Blu tack

Education delivery will be split into four sections - these should be run one after the other within the same session:

- A.** Introduction to colic
- B.** Colic signs activity
- C.** Nutrition activity
- D.** Objective development

## A. Introduction to colic

A short introduction (5 -10 minutes) to colic should be given. Below is a list of topics that **MUST** be covered in the intro, these can be covered in any order. There is an example introduction on **page 9** if needed.

### **Topics to cover during introduction:**

- Colic is a term used to describe abdominal pain in horses.
- It is important to be able to identify colic.
- It is important to prevent colic because...
- It is very painful for the equid and can be fatal.
- Treatment can be difficult or impossible.
- It can have financial consequences for the owner.
- There are lots of causes of colic, including inappropriate nutrition.
- Equids have complex digestive systems, so correct nutrition is very important.
- Small stomach and cannot vomit.
- Very long intestines.
- Water is very important to ensure normal gastrointestinal function.

**Example introduction:**

Colic is a term used to describe abdominal pain in horses. There are lots of causes and types of colic and the amount of pain the equid is in, and the outcome can vary. Colic can be very difficult to treat and, in some cases, the only way to fix it is through surgery, which isn't often possible, so many equids die because of colic. Therefore, it is very important to prevent colic from happening in the first place. Can anyone think of any other reasons why we want to prevent colic?

There are a lot of things that can cause colic including parasites, bad nutrition, and stress. Today we will focus on nutrition. Nutrition is important because equids have very complicated digestive systems and there are lots of things that can go wrong. There are two things about the equine digestive system that we want you to remember 1. horses have very small stomachs and cannot vomit and 2. they have very long intestines that twist and turn a lot to fit inside their abdomen.

So why is a small stomach so important? ... if you overfeed the horse, the stomach begins to grow and that could be a cause of colic, this we call "gastric dilation" ... the stomach swells up to the point of bursting and the animals die... so those stomach colics are generally related to what we feed them. And the intestines have many curves in order to fit, when they eat very dry, coarse grass and there is no good water consumption the food can get stuck, and we call this "impaction" and this is another colic. The equine digestive system is very sensitive and if we let our equids eat food that is not made for them then they will get colic. But we will talk about what to feed our equid in more detail in a bit.

It is also very important to know when our equid has colic, so we can then try to treat them so we will talk about the signs of colic first.

Notes:

## Colic signs activity

### Materials needed:

- Colic sign cards (total of 10 cards)

### Activity:

Hand out colic sign cards to participants, allowing them 5 - minutes to discuss what they can see on the cards as a group. Following this, select an owner to start by explaining what they can see on their card. Encourage others to agree or disagree. For each colic sign card, ask the group the facilitator questions listed below . **Repeat this until all cards have been discussed.** Once all colic sign cards have been discussed, allow the group time to discuss any other signs of colic that they know. Once this activity is finished, check for any questions, and collect all cards.

### Facilitator questions (For each colic sign, please ensure all of the following questions are asked):

- What can you see in this drawing?
- How concerned would you be if you saw your equid like this?
- Does this suggest that this equid has colic?
- Would you see these signs of colic in horses, donkeys or mules?
- What would you do if you saw your equid like this?

### Prompt / additional questions (these can be asked to encourage discussion if needed):

- *How painful do you think this equid would be?*
- *Would you be more or less concerned if you saw these signs in a donkey/ mule/ horse?*



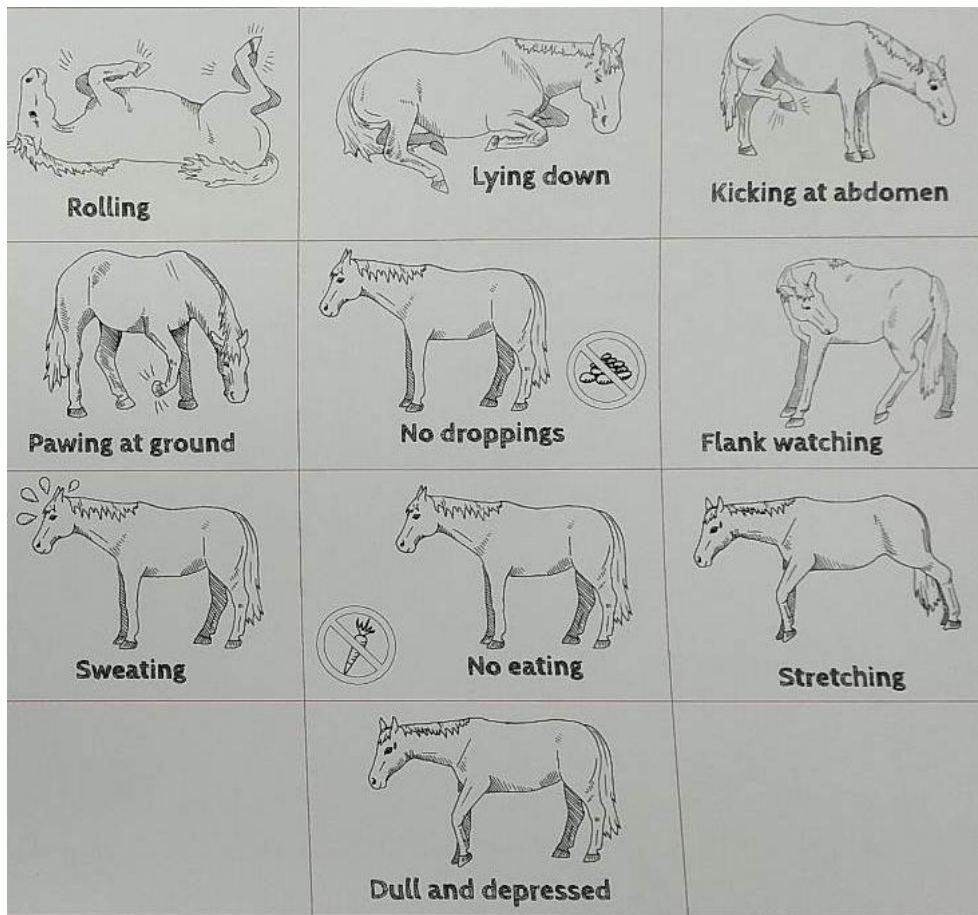


Figure 34: Colic cards (cards will have all writing removed)

Notes:

## **B. Nutrition activity**

### **Materials needed:**

- Happy equid, sad equid poster
- Post it notes
- Blue tack

### **Step one:**

Stick the equid poster up where it can be seen clearly by all participants. Introduce this activity by explaining that we are moving onto prevention of colic, and that through previous focus groups within these communities, we have identified the importance of nutrition.

### **Step two:**

Participants should be given post it notes. Ask participants to write or draw any 'good' or 'bad' nutrition related management practices on the post-it notes. Ask participants to stick the 'good' management on the happy equid and explain why they feel this is a 'good' management practice. The same should be done by sticking 'bad' management practices on the sad equid.

Below is a list of management practices that need to be covered. If participants do not cover these within the session please ask participants to cover each topic.

'Good' management practices:

- Concentrate feed should be fed little and often
- The majority of an equids diet should be fodder (grass, hay etc)
- Equids should be offered water frequently throughout the day
- Ripe bananas can be fed to equids in small quantities
- Food should be stored out of the sun

'Bad' management practices:

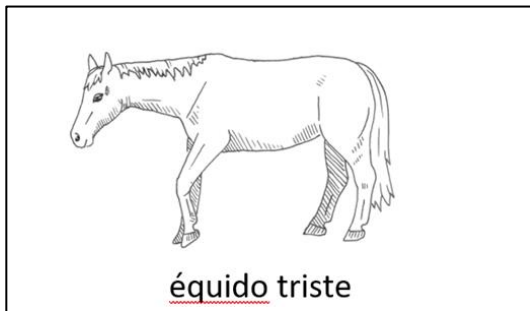
- food that has fermented/ gone off should be thrown away as this can cause colic
- Fermented bananas should not be fed to equids
- human leftovers should not be fed to equids
- contaminated water can cause colic

- Molasses or mogolla water can cause colic

If ensure all management practices are on the appropriate side before finishing this task. Once completed, leave this activity up as it will be needed for the objective development section.

**Quick/additional questions (can be asked to encourage discussion if needed)**

- Why do you think this practice is good or bad?
- How could you improve this to make it good practice?
- Why/how might this practice increase/decrease the risk of colic?



Notas:

### C. Objective development workshop

#### Material needed:

- Previous exercise (completed)
- Leaflets
- Dictaphone
- Pens

#### Step one:

Please audio record this session. Please complete this section immediately after the nutrition exercise. Ask participants to select / decide on **one or two bad practices** as a group that currently relate to how they manage their equids. For each bad practice selected, please ask the facilitator questions listed below.

#### Facilitator questions:

- Why have you chosen this practice?
- What do you currently do in terms of \_\_\_\_\_?
- How do you think you could change this to make it a 'good' practice?
- What challenges might you come across if you were making those changes?
- How could you overcome these challenges?
- What support would you need from others in your community? What other external support would you need?

#### Step two:

Participants should be asked to come up with one community objective that they want to change. This should be one small thing they would like to change and the steps that are needed for this change to occur. Individuals can also come up with their own objective for themselves. Below are some questions to help give participants a bit more guidance. It might be helpful to work through these as a group whilst deciding on an objective.

**Facilitator questions:**

1. How will this change improve the lives of working equids and their owners?
2. Who is going to help with this change?
3. Step by step, please explain how you will carry out this step? \*\*
4. What could stop us from achieving this change?
5. How can we overcome any challenges?
6. How can we help motivate each other to make this change?
7. Will it be possible to maintain this change long term?

*\*\* Question 3 may need further questions that are specific to the objective e.g. if participants want to prevent their equids from eating rubbish, the following questions could be asked:*

- *Which day/ time is best for rubbish to be removed?*
- *Where will the rubbish be moved to?*
- *How will rubbish be moved/ transported away from grazing areas?*

**Example objective:**

- We want to prevent our equids from eating rubbish so once a week we will clear our equids grazing areas of rubbish.

Owners should now be given a leaflet each and explained what is shown on it. Ask owners to write/ draw the community and individual objectives in the space provided. Ensure there is time at the end for any questions on the activities/ leaflet etc.

Community objective:

### **Selection of owners for case study**

Before moving onto the post-training survey please identify one or two participants for the case study for day 2.

These owners should:

- Have a problem with colic OR nutrition e.g. owners whose equids have experienced multiple cases of colic within the last year; those who found the nutrition activity particularly challenging; less experienced owners who know very little about colic etc.
- Be available to participate the following day.
- Be willing to participate in an owner interview AND happy for observations to be made where they keep their equid(s).
- Be over 18 years old.

Please organise timings and where to meet and record this information on **page 19**.

#### 4. Post - training survey

##### **Materials needed:**

- Post- training survey (owners should already have this as it attached to the pre-training survey)

Ask owners to complete and return the post-training survey (owners may require help in doing so).



Please ensure owners complete these and hand them back before leaving.

Day one notes:



**Day 2- Case studies**

Record details of the owners who are participating in the second day case studies.

<b>Owner</b>	<b>Community</b>	<b>Contact details</b>	<b>Date/ time meeting</b>	<b>Address</b>	<b>Notes</b>
1					
2					
3					
4					
5					
6					
7					
8					
9					

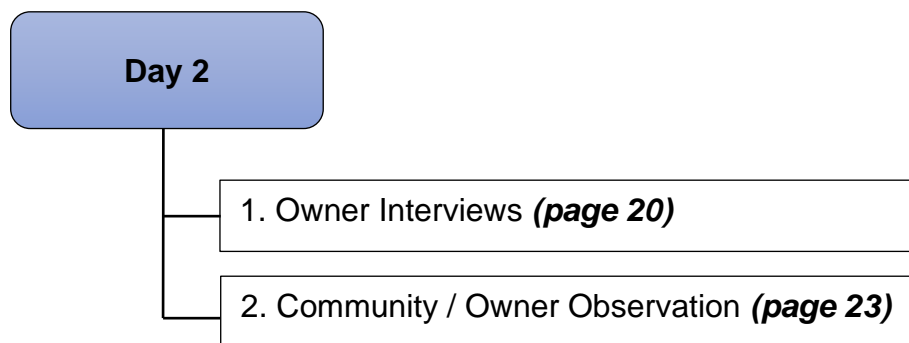
10					

**Day 2 Case studies - Overview**

**Materials needed:**

- Consent forms (for interview and observations)
- Camera
- Dictaphone
- Lined paper

**Overview:**



Before starting, make sure all those participating in the interview, or are likely to be in any photos, have **signed a consent form**. The activities shown in the figure above can be completed in any order. However, observations should be done throughout the whole visit.

**!** Ensure anyone participating in the case study has completed a consent form - including consent for **ALL** photos and videos taken.

## **1. Owner interview**

### **Materials needed:**

- Dictaphone
- Camera

Interviews should be carried out with the owner, with questions split into two sections:

1. Colic
2. Nutrition

The colic section of the interview can be carried out in a more formal setting (one-to-one discussion) whereas the nutrition management section will be a more interactive exercise involving participants taking facilitators to where they keep or care for their equid. For example, if an owner is discussing how their equids drink from a local stream, if possible the owner should take facilitators to see this and observational notes and photos should be taken).

## Interview questions

Before starting the interview, a short introduction, including an explanation of the two sections covered, should be given. Following this, questions should start with a discussion of colic, as shown below. **All numbered question must be asked.**

### Section 1: Colic

1. **How much of a problem is colic for you and your equid(s)?**
2. **When was the last time one of your equids experienced colic?**
3. **What happened in this case of colic?**

#### *Prompts for Q3*

- *How did you know your equid had colic?*
- *What did you do once you realised your equid had colic?*
- *What treatment did you use?*
- *Did your equid survive?*

4. **Why do you think your equids colic?**

#### *Prompts for Q4*

- *What causes of colic do you know?*

Notes:



## **Section 2: Nutrition**

For these questions, please ask participants to show you items of feed or locations of water etc., if that is possible.

**1. What is your equids day to day routine?**

**2. What is your equids daily routine in regards to water and feeding?**

*Prompts for Q2*

- *(Can you show us) what you feed your equid?*
- *How often do you feed your equid?*
- *(Can you show us) how much you feed your equid at once?*
- *How often does your equid have access to water?*
- *Can you show us your equids water source?*

**3. How do you decide what to feed your equid?**

*Prompts for Q3*

- *How much do financial concerns impact your choice of what to feed your equid?*
- *Who else is involved in the decisions around your equids care/ nutrition?*
- *How do other people influence what you feed your equid?*

**4. How does your equids feeding routine differ from other equids feeding routines?**

*Prompts for Q4*

- *Why do you think these might differ?*
- *How would people react if you did feed your equid something different?*

**5. Is there anything you wish you could change about your equids feeding routine?**

6. Why are you currently unable to change this?

Notes:

## 2. Observations

Observational notes and photos should be done throughout the visit. Include **anything** that might be relevant (better to have too much than too little!). The list below provides a rough guide of topics that are important to consider. Please use answers from the interview to identify any other aspects of care that you or the owner feels are important.

### Topics to include in observations:

- General environment**
- Roads, paths
- General equid management- tack, stable etc
- Medications on site
  
- Specific feeding practices**
- Types of feed
- Grazing areas
- Water source
- Storage of feed

All the above should be observed but additional observations can be undertaken for anything that might be relevant.



Be careful taking photos with people in! Will need their consent for photos to be taken and used for research! **DO NOT photograph anyone under the age of 18** (even in the background of photos)!



Day two notes:

**Community notes**

Santa Marta notes:

Cocorna notes:

Andes notes:

Apartado notes:

## Appendix XII: Owner Knowledge Survey Round 1 and 2 (Chapter Six)

### Pre-training survey






Participant number: \_\_\_\_\_

Community: \_\_\_\_\_

Date: \_\_\_\_\_

### Colic

1) How much does colic worry/ concern you (please circle)?

0	1	2	3	4	5	6	7	8	9	10
Not worried/ concerned at all					Extremely worried/ concerned					
										

2) What signs of colic do you know?

3) What causes of colic do you know?

**4) How important do you think it is to prevent colic (please circle)?**

0	1	2	3	4	5	6	7	8	9	10
Not important at all					Extremely important					

**Nutrition**

**1) How much and how often is your equid fed in addition to grazing?**

**2) How much and how often does your equid drink water?**

**3) Which of the below foods do you think are appropriate to feed to an equid?**

- |   |   |
|---|---|
| <input type="checkbox"/> Leftover human food      | <input type="checkbox"/> Cattle feed          |
| <input type="checkbox"/> Grass                    | <input type="checkbox"/> Chopped grass        |
| <input type="checkbox"/> Fermented/ black bananas | <input type="checkbox"/> Yellow/ ripe bananas |

**4) Is it likely that your equid has access to rubbish or other non-food items that they may consume?**

- Yes
- No

**5) Is there anything you want to/ wish you could change regarding your equids nutrition?**

## Post-training survey

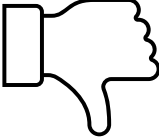
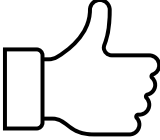
Participant number: \_\_\_\_\_

Community: \_\_\_\_\_

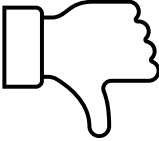
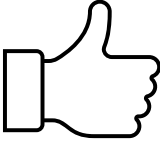
Date: \_\_\_\_\_

**1) On the scale below how much do you agree with the following statements:**

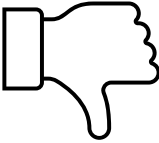
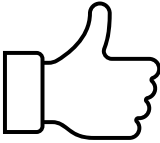
**a. I found this training/ education interesting.**

 <span style="float: right; width: 100px;"></span>											
<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	
Strongly disagree											Strongly agree

**b. I think this training/ education improved my knowledge.**

 <span style="float: right; width: 100px;"></span>											
<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	
Strongly disagree											Strongly agree

**c. This training/ education has encouraged me to make daily changes to my equids routine.**






										
0	1	2	3	4	5	6	7	8	9	10
Strongly disagree					Strongly agree					

**2) Community behaviour change objective:**

**3) Individual behaviour change objective:**

**Colic**

**1) How much does colic worry/ concern you (please circle)?**

0	1	2	3	4	5	6	7	8	9	10
Not worried/ concerned at all					Extremely worried/ concerned					
										

**2) What signs of colic do you know?**

**3) What causes of colic do you know?**

--

**4) How important do you think it is to prevent colic (please circle)?**

0	1	2	3	4	5	6	7	8	9	10
Not important at all					Extremely important					

**Nutrition**

**1) Do you intend to change anything in regard to what your equid is fed in addition to grazing?**

--



**2) Do you intend to change anything in regard to what your equid drinks per day?**

**3) Which of the below foods are appropriate to feed to an equid?**

- |   |   |
|---|---|
| <input type="checkbox"/> Leftover human food      | <input type="checkbox"/> Cattle feed          |
| <input type="checkbox"/> Grass                    | <input type="checkbox"/> Chopped grass        |
| <input type="checkbox"/> Fermented/ black bananas | <input type="checkbox"/> Yellow/ ripe bananas |

**4) Do you intend to make any changes to reduce the access your equid has to rubbish or non-food items?**

Appendix XIII: Owner Knowledge Survey Round 3 (Chapter Six)

**Final survey**






Participant number: \_\_\_\_\_

Community: \_\_\_\_\_

Date: \_\_\_\_\_

**Colic**

**1) How much does colic worry/ concern you (please circle)?**

0	1	2	3	4	5	6	7	8	9	10
Not worried/ concerned at all					Extremely worried/ concerned					
										

**2) What signs of colic do you know?**

**3) What causes of colic do you know?**

## Appendix XIV: Consent Form for Focus Groups (Chapter Six)

### INFORMED CONSENT

**RESEARCH PROJECT:** Education as a prevention strategy for the treatment of colic in working equids.

**RESPONSIBLE RESEARCHER AND INSTITUTION:** Santiago Henao Villegas, MV, MSc, PhD (Co-investigator) Universidad CES.

#### WHICH PROCEDURE WILL YOU PARTICIPATE IN DURING THE STUDY?

If you agree to be part of this study, you will be asked basic questions and information about your social and economic conditions. All information Will be handled with strict confidentiality and questions should not be sensitive.

**Authorisation for the use of image rights on photographs and audiovisual productions (videos) and intellectual property rights granted to the group of researchers.**

By means of this form, I authorise the CES University research group to use and process my image rights to include them in photographs and audiovisual productions (videos), as well as copyright, related rights and in general, all intellectual property rights related to image rights. This authorisation shall be governed by the applicable legal regulations and may be used for educational and informative purposes in different scenarios and platforms. This video/ photo is non-profit and Will not be used for any other purpose at any time. This authorisation has no specific geographical scope, so the images in which it appears may be used in the territory of the world, nor does it have any time limit for its concesión, nor for the exploitation of the images, or part of them, so my authorisation is considered granted for an unlimited period of time.

#### **In case of doubts, complaints, claims, suggestions, who can ou contact ?**

Santiago Henao Villegas can be contacted by telephone at 3235782533, or via institutional email: [shenao@ces.edu.co](mailto:shenao@ces.edu.co) . Also through the CES University telephone (+574) 4440555.

By signing this consent form, you certify that you have been clearly informed of the purpose of the research, as well as the risks, benefits, data management and costs. You further certify that you agree to your participation.

- I confirm that I am over 18 years of age
- I understand that I am not obliged to give consent and I may withdraw my participation at any point of the process
- I understand that my contribution to the study will be recorded and used for research purposes
- I understand that the research from this study may be presented at research conferences or meetings

For the record, this is signed on the \_\_\_\_\_ day of the month \_\_\_\_\_, \_\_\_\_\_.

**Participant**

**Responsible Researcher**

**Witness 1**

**Witness 2**

\*A duplicate is given to the subject of the investigation

## Appendix XV: Owner Feedback Focus Group Transcript (Chapter Six)

### Focus group – For owners who attend visit in Feb 2023

- Must have attended the visit in February 2023
- Must be over 18

#### **1. Can you remember participating in the training in February?**

- *Prompt: Provide summary if needed (can show leaflets, activities again to remind them)*

#### **2. What did you learn during this session?**

- *Prompt: What was this session about?*
- *Prompt: What topics did you cover?*
- *Prompt: What was the most interesting thing you learnt?*

#### **3. Was there anything you changed as a result of this training? If yes, was there anything you found difficult about making this change?**

- *Prompt: Have you made any changes to your equids daily routine as a result of the training you received?*
- *Prompt: Have your equids day to day routine changed at all in the past two months?*
- *Prompt: How did you overcome any challenges you faced when making any of these changes?*

#### **4. Was there anything you wanted to change but you couldn't? If yes, what barriers did you face that made this change difficult or impossible?**

- *Prompt: Why did you want to make these changes?*
- *Prompt: How do you think these challenges could be reduced to make change possible?*

#### **5. What could have been done differently to improve this training?**

- *Prompt: What could have been done differently to make you more likely to be able to change how you manage your equid(s)?*

- *Prompt: What could have been done differently to make the training more interesting?*
- *Prompt: What information would you like to be given?*
- *Prompt: How would you like information to be given to you?*

**6. What else do you think could be done to help you and your equids?**

**Focus group – For owners who did NOT attend visit in Feb 2023**

- Must NOT have attended the visit in February 2023
- Must be over 18

- 1. Have you heard about the colic training that was offered here in February?**
- 2. If yes, can you summarise what you have heard about it?**
- 3. If no, what aspects surrounding colic do you think would be beneficial to learn about?**
- 4. How do you think information around colic could be delivered to you and other working equid owners?**
- 5. What do you think could be done to help you and your equids?**

## Appendix XVI: Research Team Qualitative Questionnaire (Chapter Six)

### Interview for Arrieros and CES

<p><b>1. How did you find the provision of the educational materials?</b></p>
<p><b>2. Did you think the overall content was appropriate?</b></p>
<p><b>3. Did you think the content was well understood by owners?</b></p>
<p><b>4. Do you think the quantity of content was too much/ too little?</b></p>
<p><b>5. What parts did owners not understand/ find more challenging?</b></p>

**6. Were owners engaged in the education?**

**a. Were there any owners who were reluctant/ refused to participate? Why do you think this was?**

**7. Was the education easy to deliver? / What challenges did you face when providing this training?**

**a. What could be done to make provision of the education easier for you to deliver?**

**8. How could the education be improved?**

**9. Do you have any other comments about the education in general?**