

1 **Owner reported diseases of working equids in central Ethiopia**

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14 **Keywords:** working equid, participatory, disease, horse, donkey, developing country

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16 **Acknowledgements:**

17

18 The authors are grateful to the Wellcome Trust Livestock for Life scheme for the funding of this
19 project. We also thank the staff at both SPANA and The Donkey Sanctuary (UK and Ethiopia) for their
20 assistance and also the College of Veterinary Medicine and Agriculture, Addis Ababa University for
21 their cooperation. The authors also thank all the participants who were involved in this study.

22

23 **Conflicts of interest**

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25 The authors have declared no competing interests

26

27 **Sources of funding:**

28

29 The authors are grateful to the Wellcome Trust Livestock for Life scheme for the funding of this
30 project.

31

32 **Summary**

33

34 **Reasons for performing study:** Working horses, donkeys and mules suffer from numerous diseases
35 and clinical problems. However there is little information on what owners perceive as important
36 health concerns in their working animals.

37

38 **Objectives:** To identify and prioritise, with owners, the diseases and other health concerns in
39 working equids in central Ethiopia using participatory methodologies.

40

41 **Methods:** A Participatory Situation Analysis (PSA) was conducted with carthorse and donkey owners
42 in 16 sites in central Ethiopia. Multiple participatory methodologies were utilised, including ranking,
43 matrices and focus group discussions. Owners' perceptions on frequency, importance, morbidity and
44 mortality of volunteered diseases and the clinical signs that owners attributed to each disease were
45 obtained; information regarding the impact of these diseases and health concerns was also sought.

46

47 **Results:** Forty separate disease and health problems were volunteered by carthorse and donkey
48 owners. Horse owners volunteered a musculoskeletal syndrome (with the local name 'bird', clinical
49 signs suggest possible disease pathologies including equine exertional rhabdomyolysis), colic and
50 Epizootic Lymphangitis most frequently, whereas donkey owners volunteered sarcoids, nasal
51 discharge and wounds to occur most frequently. One problem (coughing) was volunteered
52 frequently by both horse and donkey owners. Owners demonstrated knowledge of differing
53 manifestations and severity of these problems, which resulted in differing impacts on the animals
54 working ability.

55

56 **Conclusions and potential relevance:** Although many of the diseases and clinical signs had been
57 reported previously, this study also identified some previously unreported priorities such as rabies in

58 donkeys, an unidentified musculoskeletal syndrome in horses and respiratory signs in both horses
59 and donkeys. The information gathered during this participatory study with owners may be used to
60 inform future veterinary and educational programme interventions, as well as identify future
61 research priorities.

62

63 **Introduction**

64

65 It is estimated that the total world equine population is around 112 million, although this is very
66 likely to be a gross underestimate [1]. It is reported that 2.0 million horses, 0.36 million mules and
67 7.0 million donkeys comprise the working equid population in Ethiopia, and this represents the
68 largest population of donkeys in Africa [2]. Working equids have a direct impact on the lives of rural
69 people by reducing the transport burdens of water, fuel, wood and goods [3], transporting people
70 and in some areas for agricultural purposes [3,4,5].

71

72 Disease and health problems affecting working equids and their productivity in Ethiopia have been
73 previously documented and include: Harness related wounds and sores [6,7,8,9,10]; colic [7,8];
74 coughing and nasal discharge [7,8,11]; Epizootic Lymphangitis [12,13,14,15,16]; African horse
75 sickness [17,18,19]; Helminthiasis [10,20,21,22]; ocular disease [23]; lameness [7,24] and sarcoids
76 [10,25]. Many of these health and welfare problems are also found in other low and middle-income
77 countries [26,27,28,29,30,31,32].

78

79 There is, however, little information on working equids owners' perceptions and prioritisation of
80 these disease and health problems in Ethiopia, or elsewhere. In two participatory studies in Ethiopia,
81 the most frequently encountered problems were respiratory problems, colic, musculoskeletal and
82 hoof problems, back sores and EZL [33,34]. Participatory methods are frequently used in livestock
83 research and are becoming more frequently used in studies on working equid health. The aim of this

84 study was to identify and prioritise the disease and health concerns that affect working equids
85 according to their owners using participatory approaches. Owners' perceptions on frequency,
86 importance, morbidity and mortality of volunteered diseases, and the clinical signs that owners
87 attributed to each disease were also obtained, enabling the targeting of programmatic interventions
88 and future research.

89

90 **Materials and Methods**

91

92 *Survey Sites*

93

94 The Participatory Situation Analysis (PSA) was conducted between January and March 2008. Sites
95 were selected from three regions in central Ethiopia: Oromia, Amhara and Southern Nations,
96 Nationalities and People's Region (SNNPR) (Figure 1 and 2, Supplementary Information). Sixteen
97 sites from 12 different towns and villages were selected in a range of agro-ecological zones, and
98 comprised either rural villages that contained predominately donkey owners, or towns with
99 predominantly horse owners (Table 1 and 2, Supplementary Information). Sites varied between
100 those located in the highland regions, (e.g Debre Brehan, 2840m) to those located in the lowland
101 regions (e.g. Ziway, 1643m). Towns and villages were selected based on the logistics of
102 transportation, but were chosen to be representative of other towns and villages in the region. Sites
103 were designated as either "exposed" if they had previous known exposure to an equine NGO or
104 equine education/research programme, or "unexposed" if they were a naive population with
105 regards to the above criteria.

106

107 *Survey Participants*

108

109 Participants were eligible for inclusion in the PSA if they lived within the selected town or village and
110 owned, or used, a donkey or horse. Donkeys in these sites were primarily used to carry water,
111 firewood and agricultural products, whereas horses were primarily used to carry people (and goods)
112 in carts. Participation was voluntary with no financial incentive offered. Participants were selected
113 for the PSA using two different methods. In exposed towns and villages, owners were approached
114 during their attendance at the mobile veterinary clinic. Participants from unexposed towns and
115 villages were recruited using development agents assigned from the relevant Bureau of Agriculture.
116 Participants were asked to gather at a designated site at a specific time. The study was conducted in
117 accordance with the research ethics requirements of the Faculty of Veterinary Science at the
118 University of Liverpool. Informed verbal consent was obtained from all participants involved in the
119 study following a short introductory briefing concerning the purpose of the PSA. This briefing also
120 stressed that participation in the study was voluntary and that people were free to leave at any time.

121

122 *Participatory Situation Analysis (PSA)*

123

124 The PSA was conducted in either of two regional languages (Amharic and Afan Oromo) as dictated by
125 the participants' preference. One of the authors (GT; an Ethiopian national) was fluent in Amharic,
126 Afan Oromo and English and was the primary facilitator and translator for the PSA. GT had previous
127 experience in the field of animal health and had received training in participatory approaches. The
128 PSA was based on five questions in a semi-structured interview (SSI) format, and utilised a number
129 of different methodologies (Table 3, Supplementary Information). The PSA was piloted with horse
130 and donkey owners from other villages and towns not involved in this study, and questions
131 underwent reverse translation (the process of translating study questions back into English from
132 local Ethiopian languages to check for accuracy in original translation) prior to commencing the
133 study.

134 Participants were initially asked to volunteer all disease and health problems that afflicted either
135 their donkeys or horses. Following this, the group was asked to arrive at a consensus on a ranking of
136 these diseases in order of how commonly they were encountered. For each of the volunteered
137 diseases, the group was asked to form a consensus on how long an animal would be out of work and
138 unable to perform its duties if afflicted with a particular disease. In open discussion, owners were
139 then asked to describe the clinical signs associated with the volunteered problems. Piloting on 10
140 groups in four sites led to minor modifications to the interview questions. These modifications were
141 made to ensure that an accurate translation of the researchers intended questions was obtained

142

143 *Data Recording and Analysis*

144

145 Data were initially translated and recorded in written format by a dedicated recorder in English, and
146 using digital photos of completed matrix boards. These data were then entered into a spreadsheet
147 programme (Microsoft Excel 2007, Microsoft Cooperation, USA). The R Language for Statistical
148 Computing (<http://www.r-project.org>) was used for analysis of quantitative data and for plotting
149 figures. NVIVO 8 (QSR International) was used to aid thematic coding of data obtained during the
150 open discussions. Owners volunteered disease and health problems using local names in either of
151 the two regional dialects (Afan Oromo and Amharic). These local names were translated into
152 equivalent English names during the analytical stage; where locally named conditions were not
153 directly translatable the clinical signs described by the participants were compared with standard
154 descriptions of diseases in veterinary textbooks used to assist identification of the disease or health
155 problem. Health problems were ranked in two ways: first simply by the number of times individual
156 groups volunteered the specific problem (count rank); and, second, using a weighted score
157 depending on where groups ranked each problem (score rank); in which the problem ranked first
158 was given a score of ten, nine for second place, continuing until all problems were assigned a score.
159 We calculated these ranks for unexposed and exposed sites and both sites combined.

160

161 **Results**

162

163 A total of 160 participants (two groups of five participants in each of 16 sites) participated in this
164 study. Forty separate disease and health problems were volunteered by horse and donkey owners
165 (Table 4, Supplementary Information). Data saturation was achieved during the group discussions.
166 As the number of group discussions progressed, no new disease entities were volunteered. Only one
167 condition (coughing) was volunteered frequently by both horse and donkey owners (Table 1 and 2).
168 Numerous problems were volunteered more frequently by horse owners (e.g. musculoskeletal
169 syndrome with the local name 'bird', clinical signs suggest possible disease pathologies including
170 equine exertional rhabdomyolysis, EZL and colic) or donkey owners (e.g. sarcoids, nasal discharge
171 and wounds). Donkey owners perceived wounds to be the most common problem affecting their
172 animals in unexposed towns, followed by sarcoids, nasal discharge and coughing (Table 1). In
173 exposed towns, donkey owners perceived nasal discharge to be the most common problem followed
174 by coughing (Table 1). Horse owners perceived 'bird' to be the most common problem affecting their
175 animals in unexposed sites, followed by EZL and colic (Table 2). In exposed sites, EZL was also the
176 most common problem followed by coughing, colic and 'bird' (Table 2). The results across towns and
177 villages (taking into account differences between exposed and unexposed sites) were generally
178 similar for each species, however there were some differences at high altitude (Debre Brehan)
179 where horse owners did not volunteer EZL as a health problem.

180

181 Horse and donkey owners identified the impact that each problem had on the ability of that equid to
182 perform its role and to work, and these were recorded in matrices. Owners demonstrated
183 knowledge of differing manifestations and severity of volunteered problems, resulting in a differing
184 amount of time off work (Figure 1). Groups could volunteer more than one answer for each
185 volunteered problem. For example, horse owners reported two distinct severities of EZL (Figure 1a).

186 One manifestation that does not affect the horse's ability to work and another manifestation that
187 leads to significant time off work, and ultimately to the horse not being able to work. The same
188 distribution is seen with colic in horses, with the majority of cases causing the horse to be off work
189 for less than a week, but a small number of cases leading to the horse being permanently out of
190 work or death. Coughing and lip wounds however both show that the majority of these cases have
191 little impact on the ability of horses to work. For donkey owners (Figure 1b), nasal discharge shows
192 two distinct manifestations of the disease: some donkeys remain working whilst others required one
193 week to a month off work. A similar distribution was seen with coughing. In the majority of groups
194 owners indicated that donkeys with sarcoids, wounds and parasites were not deemed to require any
195 time off work.

196

197 Both donkey and horse owners were able to attribute various clinical signs to the volunteered
198 problems (Tables 5 and 6, Supplementary Information). Thematic coding revealed that donkey
199 owners had knowledge of the location of wounds on their donkeys and knowledge of common sites
200 for sarcoids. Coding revealed that the thematic descriptions given by donkey owners to colic
201 included bloating, micro or anuria and anorexia. These are all clinical signs that may be consistent
202 with a donkey affected by colic, a frequently reported problem in working donkeys [8]. Horse
203 owners had considerable knowledge of the clinical signs frequently observed in a horse affected by
204 colic, these included rolling and restlessness. For EQL, the most commonly volunteered problem
205 amongst horses, owners accurately described the clinical appearance of the disease and the most
206 commonly reported locations of lesions. For the musculoskeletal syndrome, owners reported that
207 the two most frequently observed signs were a change in musculoskeletal system anatomy (e.g.
208 muscle tone or limb deformity) and a change in locomotion.

209

210 **Discussion**

211

212 Using participatory methodologies we were able to ascertain a more accurate picture of the
213 knowledge and perceptions of Ethiopian working equid owners concerning the major disease and
214 health concerns of working horses and donkeys. In our study, 40 separate disease, clinical signs and
215 health problems were described by horse and donkey owners, which highlights both the diversity of
216 diseases that afflict these animals and the awareness of owners to these different disease problems.
217 The problems that donkey owners perceived to be the most common were triangulated with other
218 sources of information on diseases of working donkeys in Ethiopia, and there was strong agreement.
219 Triangulation is the use of two or more methods, data sources, observers or investigators, or
220 theories within the same study [35]. For example, clinical treatment records from one non-
221 governmental organisation (NGO) (The Donkey Sanctuary, unpublished data, 2007) showed that
222 wounds, back sores and respiratory problems (coughing and nasal discharge) were the three most
223 commonly presented conditions at their mobile veterinary clinics; whilst one survey of 200 Ethiopian
224 donkey owners found the most prevalent health problems encountered as coughing and nasal
225 discharge [8], followed by wounds and colic. Donkey owners in another study ranked respiratory
226 disease as the disease problem most afflicting their donkeys [36], whilst focus group discussions in a
227 different study identified respiratory problems (coughing and nasal discharge), colic and back sores
228 as the health problems most commonly affecting equids [33]. The difference in the ranking of
229 wounds on donkeys between the exposed and unexposed sites could potentially be explained by the
230 successful impact of NGO interventions (in exposed sites) aimed at reducing wounds through
231 harness modification and owner management changes.

232

233 Owners in this study ranked rabies in the top five diseases to affect their donkeys, and yet this
234 disease is not commonly seen in cases presenting at NGO clinics. Reasons for this could include:
235 clinical cases dying before presenting at clinic or owners recognising clinical signs and abandoning
236 animals or performing euthanasia. Owners in this study had a detailed knowledge of rabies, its
237 transmission and the disease prognosis. Rabies has been identified in a number of species in Ethiopia

238 including working donkeys [36,37,38]. This finding concerning owners' perception of rabies in their
239 donkeys is of particular importance due to its zoonotic potential, and lack of current veterinary
240 interventions to reduce rabies within the equid population.

241

242 When the problems that horse owners perceived to be the most common were triangulated with
243 the clinical records of another NGO (Society for the Protection of Animals Abroad, unpublished data,
244 2008) these conditions were in the top five disease problems most commonly presented to
245 veterinary clinics for treatment. There is also agreement between this study's findings and those
246 from other participatory studies [33,34] and other studies [7]. One participatory study identified EZL,
247 hoof problems, "bird", colic and respiratory problems as the top five disease problems affecting
248 working cart horses [34], whilst another study identified respiratory problems (coughing and nasal
249 discharge), colic, back sores and EZL as the health problems most frequently identified by working
250 equid owners [33]. Whilst a number of health problems were volunteered by both unexposed and
251 exposed groups (including coughing, colic and lip wounds), horse owners in exposed groups more
252 frequently volunteered coughing, lip wounds and parasites than unexposed groups. One potential
253 explanation for this finding could be that intervention programmes organised by NGOs have raised
254 awareness amongst owners in exposed sites to these problems compared to owners in unexposed
255 sites.

256

257 EZL has been well documented as a major problem of horses in Ethiopia that has a major impact on
258 the socio-economics of owners [12,15,16,39]. Studies in other developing countries have shown
259 lameness, gait abnormalities and foot problems to be extremely common in all working equids
260 [28,32]. In one study, 74% of 201 interviewed Ethiopian carthorse owners said lameness was a
261 disease constraint, ranking it fourth out of all diseases volunteered [7]. In this study, owners did
262 differentiate between a volunteered musculoskeletal syndrome (whose local name was 'bird') and
263 foot abscesses, which they also volunteered as a top ten problem in this study. It was not possible to

264 positively attribute a specific disease to this syndrome (“bird”), although the clinical signs suggest
265 possible disease pathologies including equine exertional rhabdomyolysis (owners reported that the
266 two most frequently observed signs were a change in musculoskeletal system anatomy (e.g. muscle
267 tone) and a change in locomotion), Equine exertional rhabdomyolysis has been reported in working
268 equids in other countries [40]. Further research is required to explore this health problem in greater
269 detail with owners, preferably involving clinical examinations and diagnostic investigation of the
270 suspected equids with this syndrome.

271

272 Harness related wounds have previously been documented as one of the most prevalent health
273 problems in equids in Ethiopia [6,7,8] and this is consistent with literature from other developing
274 countries [29,30,31]. However in this study, owners perceived wounds on horses to be less of a
275 problem than was expected by the authors, suggesting that although they may be prevalent as
276 previously reported by published literature [6], they may be perceived as lesser significance to horse
277 owners in this study, or they are not as common in this population due to NGO programmatic
278 interventions.

279

280 Both cart horse owners and donkey owners were able to identify differing clinical manifestations or
281 severities of diseases that had varying degrees of impact on the animal’s ability to work. Horse
282 owners’ descriptions of the presenting clinical signs of EZL were consistent with the clinical pattern
283 seen in an EZL case, with progression from a mild case to a more severe case that is not treatable
284 and ultimately leads to horses being abandoned [41]. A similar distribution for colic is also consistent
285 with the clinical pattern seen in colic cases, with the majority of clinical cases resolving in a short
286 period of time, whilst a minority are catastrophic abdominal events leading to death [42]. Donkey
287 owners described the impact of nasal discharge as one of two patterns, either no impact, or that of
288 requiring one week to a month off work. This may be due to the different possible aetiologies
289 causing nasal discharge and coughing in donkeys. Some clinical cases could be mild, whilst others

290 such as Strangles (*Streptococcus equi* infection) have the potential to be more severe. Little is known
291 about the aetiology of respiratory disease in working horses and donkeys. In one participatory study,
292 forty-four different respiratory syndromes were recognised by horse owners [11]. A subsequent
293 cross-sectional study across 19 sites suggested exposure to *Streptococcus equi subsp. equi* was
294 approximately 13%, equine viral arteritis 3.4% and exposure to equine influenza rare [11]. While
295 both studies supported infectious diseases as one aetiology for respiratory disease, other possible
296 aetiologies could include environmental and management factors. Further research is needed to
297 explore the other potential causes of respiratory disease.

298

299 This study relied on participants volunteering information about clinical signs and diseases and we
300 were unable to validate the accuracy of their identification. It is also possible that due to language
301 translation issues we may have misclassified some diseases, a potential limitation of the study. The
302 participatory approaches used in this study to gather predominately qualitative information have
303 their strengths and weaknesses. The strengths of participatory approaches are its ability to generate
304 locally specific information that has local validity [35], and allows in-depth discussions that provide a
305 better opportunity for understanding owners' concerns and perceptions [26]. Participatory
306 epidemiology has a role to play in strengthening stakeholder involvement in the analysis of disease
307 problems by ensuring that both veterinarians and researchers understand the perspectives and
308 priorities of working equid owners, and helping ensure community ownership of research findings
309 [42,43]. This is of importance as prioritisation of an intervention to address problems perceived as
310 important only by external parties, is unlikely to be understood or valued by the targeted owners in
311 the absence of engagement with owners to highlight those problems and their impact on both
312 animal and owner [44].

313

314 Potential weaknesses of participatory approaches are their specificity for the geographical area in
315 which the study is conducted, and a lack of direct objective measurement of disease and health

316 problems that can be obtained with classical quantitative epidemiological studies, such as a cross-
317 sectional survey. The locations and the owners who participated in this study were deemed to be
318 representative of other locations and working equids owners in the region. However, there is
319 potential for selection bias as no random sampling process was utilised during this study to select
320 either locations or participants, and owners who volunteered to participate in this study may differ
321 in some way from those who did not want to participate. Both of these issues could potentially lead
322 to the locations and participants being a non-representative sample of the intended target
323 population.

324

325 This study has identified numerous disease and health constraints that impact on the working ability
326 of equids. It has also highlighted differences in what owners perceive as common and important
327 diseases that affect their equids and what service providers most commonly treat. The results
328 presented here have been used to inform the design and content of educational interventions that
329 aimed to increase the knowledge of working equid owners about the health and welfare of their
330 animals [45], identify areas requiring further research [11] and highlight diseases that owners
331 perceive as important requiring preventive interventions. Whilst it should be recognising that
332 infectious diseases are only one of several key welfare challenges faced by working equids,
333 developing improved diagnostics (for EZL) and improved disease surveillance (for different AHS
334 serotypes) would aid in the prevention and control of these diseases. In addition, further research
335 should focus on impact assessment of interventions on both animals and owners [26].

336

337 **Conclusion**

338

339 The participatory approaches utilised in this study allowed rapid identification and prioritisation of
340 major disease and health concerns of working equid owners in Ethiopia. This study compliments
341 previous studies by focussing on owners' knowledge and perceptions of working equid health and

342 disease problems. The information gathered during this PSA may be used to inform decisions
343 regarding the targeting of educational interventions and clinical programmes, and is of benefit to
344 veterinarians, government and NGO's in identifying areas requiring further research. This study also
345 identified that certain diseases remain poorly characterised by owners, and potentially need
346 definitive identification before effective interventions can be developed. It is recommended that
347 both quantitative and qualitative approaches are utilised as part of a comprehensive needs
348 assessment prior to defining and prioritising future interventions.

349

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351

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Table 1: Top 10 ranked (using combined count rank) health problems volunteered by 16 groups of donkey owners at eight different sites in Central Ethiopia.

Health Problem	Unexposed Sites		Exposed Sites		Combined	
	Count Rank	Score Rank	Count Rank	Score Rank	Count Rank	Score Rank
Nasal discharge	3=	3=	1	1	1	1
Coughing	3=	3=	2	2	2	2
Sarcoids	1=	2	3=	5	3	4
Wound	1=	1	7	7	4	3
Colic	6	6	8=	-	5=	9
Bloating	9=	10=	3=	3	5=	5
Rabies	-	-	3=	4	5=	6
Parasites ^a	9=	9	3=	6	5=	7
Day Disease ^b	7=	7=	8=	8	9=	8
No urination	5	5	-	-	9=	10
Weight loss	-	10=	8=	9	11=	-
Hoof problem	-	-	8=	10	11=	-
Musculoskeletal ^c	7=	7=	-	-	-	-

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^a Parasites = internal parasites (described by owners as worms).
^b Day Disease = Unknown disease.
^c Musculoskeletal = unknown musculoskeletal syndrome.
 Count rank = number of times individual groups volunteered the specific problem.
 Score rank = a score weighted depending on where groups ranked each problem (problem ranked first given a score of ten, nine for second place, continuing until all problems were assigned a score).

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500 Table 2: Top 10 ranked (using combined count rank) health problems volunteered by 16 groups of
501 horse owners at eight different sites in Central Ethiopia.

502

Health Problem	Unexposed Sites		Exposed Sites		Combined	
	Count Rank	Score Rank	Count Rank	Score Rank	Count Rank	Score Rank
EZL	1=	2	1=	1	1	1
Colic	3	3	3	3	2	2=
Musculoskeletal ^a	1=	1	4=	4	3=	2=
Coughing	5=	9	1=	2	3=	4
Lip wound	5=	10	4=	6=	5	5
Parasites ^b	-	-	4=	5	6=	6
Foot abscess	-	-	4=	6=	6=	7
Swollen legs	5=	4	9=	13	8=	8
Nasal discharge	5=	5	9=	12	8=	9=
No urination	-	11=	9=	8	10=	9=
Mouth lesion	5=	7	-	-	10=	11
Day Disease ^c	4	-	-	9	10=	12
Wound	-	-	8	10	10=	13
Anthrax	5=	6	-	-	-	-
Swelling above eye	5=	7	-	-	-	-
Joint swelling	-	11=	-	-	-	-
Bloating	-	-	9=	11	-	-

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504 ^aParasites = internal parasites (described by owners as worms).

505 ^bMusculoskeletal = musculoskeletal syndrome (with the local name “Bird”, clinical signs suggest
506 possible disease pathologies including equine exertional rhabdomyolysis).

507 ^cDay Disease = Unknown disease causing death within one day (clinical signs suggest possible
508 aetiologies, particularly African Horses Sickness Virus).

509 Count rank = number of times individual groups volunteered the specific problem.

510 Score rank = a score weighted depending on where groups ranked each problem (problem ranked
511 first given a score of ten, nine for second place, continuing until all problems were assigned a score).

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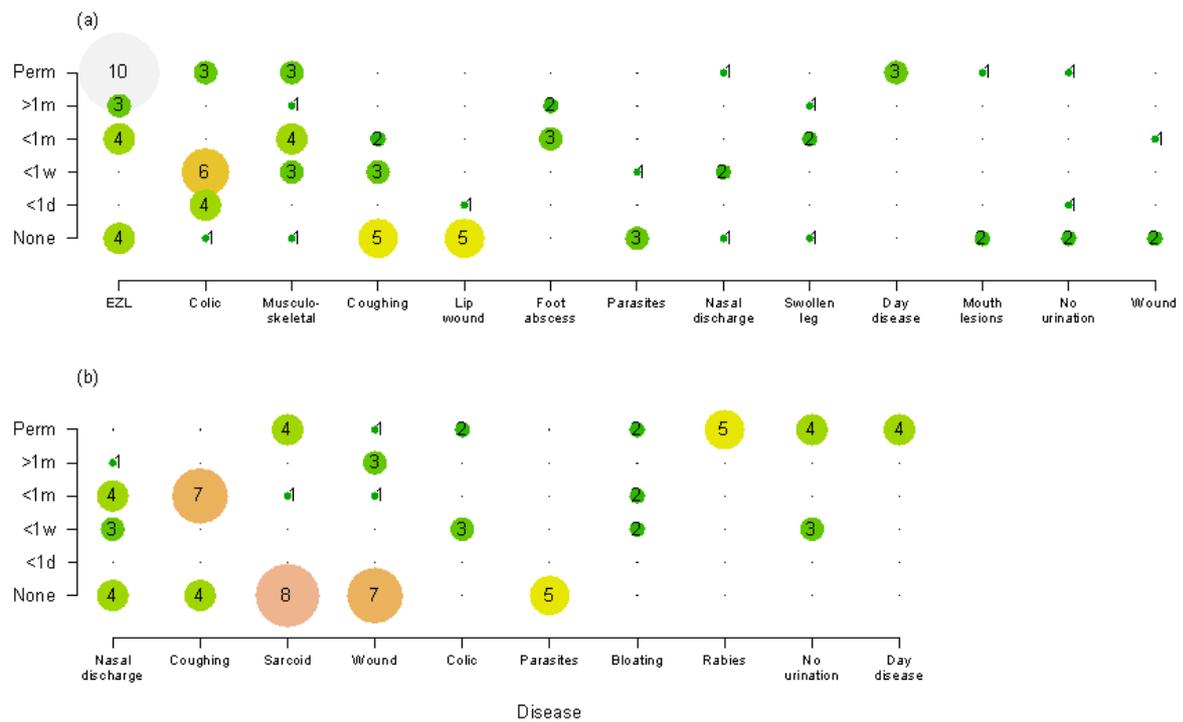
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519 Figure 1: Impact on working ability of the most frequently volunteered diseases of (a) horses and (b)

520 donkeys in Central Ethiopia.

521 The size and colour of the circle in each graph represent the number of times this category was
 522 volunteered, also shown by the number in the circle. Key (x axis): < 1 d = < 1 day, <1 w = <1 week, <1
 523 m = <1 month, >1m = > 1 month, perm = permanently out of work

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526 **Supplementary Information**

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528 Table 1 : Information on the towns and villages selected in the Participatory Situation Analysis (PSA).

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<i>Town/Village Name</i>	<i>Horse owners</i>	<i>Donkey owners</i>	<i>Region</i>	<i>Zone</i>	<i>Woreda (Municipality)</i>
Awash	U		Oromia	East Shewa	Adama
Awassa	E		SNNPR	Sidama	Awassa
Debre Brehan	E	E	Amhara	North Shewa	Basuna Warano
Debre Zeyit	E	E	Oromia	East Shewa	Ada
Dera	U		Oromia	Arsi	Dodota
Gamo		E	Oromia	East Shewa	Dugda
Gemeda (Akaki)		E	Oromia	Addis Ababa Area	Akaki
Merino (Akaki)		E	Oromia	Addis Ababa Area	Akaki
Nazaret	E		Oromia	East Shewa	Adama
Shashemene	E	U	Oromia	West Arsi	Shashemene
Sheno		U	Oromia	North Shewa	Kimbibit
Ziway	U	U	Oromia	East Shewa	Batu

530 U = Unexposed village or town. E = Exposed village or town. Southern Nations, Nationalities and
531 People's Region (SNNPR)

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536 Table 2: Data on the population of horses and donkeys in each of the study regions (Federal
537 Democratic Republic of Ethiopia Central Statistical Agency: Agricultural Survey 2013/14. Statistical
538 Bulletin 573. August 2014)

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	Amhara	Oromia	SNNPR	Ethiopia Total
	n (%)	n (%)	n (%)	
Horse	404,814 (20.6)	1,186,437 (60.4)	366,008 (18.6)	1,963,010
Donkey	2,428,758 (34.9)	2,898,282 (41.7)	571,191 (8.2)	6,953,077

540 Southern Nations, Nationalities and People's Region (SNNPR)

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Table 3: Semi-structured interview questions and participatory methodologies used in the PSA.

Semi-structured interview questions	Methodology
What are the common diseases and health concerns that affect your horses and donkeys?	Open discussion and listing
How common are these conditions?	Ranking
How long do these conditions affect your horse, mules or donkeys ability to work?	Matrices [#] (disease volunteered against time period not able to perform work)
Do these problems affect your job, income and lifestyle?	Open discussion
What are the clinical signs associated with these diseases?	Open discussion

556 [#]Options in matrices (Never out of work, out of work for up to 1 day, out of work for up to 1 week,
557 out of work for up to 1 month, out of work for greater than 1 month and permanently out of work).

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591 Table 4: Complete list of all disease and health problems volunteered by 32 groups of horse and
 592 donkey owners at 16 sites in Central Ethiopia.

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Disease and Health Problems	Groups of horse owners that volunteered the disease (n^{max} =16)	Groups of donkey owners that volunteered the disease (n^{max} =16)	Disease and Health Problems	Groups of horse owners that volunteered the disease (n^{max} =16)	Groups of donkey owners that volunteered the disease (n^{max} =16)
Musculoskeletal	10	2	Nasal discharge	4	12
EZL	14	0	Diarrhoea	1	0
Coughing	10	11	Swelling above eye	2	0
Foot abscess	5	1	Swelling on neck	1	0
Colic	11	5	Swollen leg/lameness	4	0
Corneal opacity	1	0	Joint swelling	1	0
Parasites	5	5	Shivering	1	0
Wound on upper lip	6	0	Thin	1	0
Rubbing	1	1	Abdominal swelling	1	0
No urination	3	4	Rabies	0	5
Bloating	2	5	Weight loss	0	3
Circling	1	0	Hoof problem	0	3
Hair loss	1	1	Food poisoning	0	1
Knee Swelling	2	0	Limb abnormality	0	1
Wound	3	9	Drying of the back	0	1
Sarcoids	0	10	Leech	0	1

Anthrax	2	1	Abortion	0	1
Sudden Death	0	1	Eye infection	0	1
Day Disease	3	4	Swelling of eye	0	1
Mouth lesion	3	0	Bloody urine	0	1

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595 EZL = Epizootic Lymphangitis, Day Disease = Unknown disease causing death within one day (clinical
596 signs suggest possible disease pathologies including African Horses Sickness Virus), Musculoskeletal
597 = musculoskeletal syndrome (with the local name “Bird” in horses, clinical signs suggest possible
598 disease pathologies including equine exertional rhabdomyolysis), Parasites = internal parasites
599 (described by owners as worms).

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608 Table 5: Thematically coded clinical signs attributed by donkey owners to volunteered disease
609 problems

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DONKEY OWNERS		
Problem (n=number of groups who volunteered this problem)	Thematic description	Number of groups that volunteered thematic description
Nasal Discharge (n=12)	Fluid/discharge from nose	12
	Head down	4
	Hole in throat ^a	3

	Not eating/drinking/breathing correctly	2
	Coughing	2
	Dead ^b	4
Coughing (n=11)	Coughing	11
	Swelling under abdomen	2
	Fluid from nose	4
	Death	2
	Occurs at night time	2
Wound (n=9)	Wound	9
	Awareness of wound locations	9
	Owner problem	4
	Sarcoid	2
Sarcoid (n=10)	Location of sarcoids	10
	Swelling first	4
	Bleeding	2
	Thin skin	2
Bloating (n=5)	Bloating	5
	No urination	2
	Loss of eating	3
	Reverse/not walking	2

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612 ^a Hole in throat likely to be burst abscess. ^b Owners described this disease problem presenting as
613 death in their animals on certain occasions.

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Table 6: Thematically coded clinical signs attributed by horse owners to volunteered disease problems

HORSE OWNERS		
Problem (n=number of groups who volunteered this problem)	Thematic description	Number of groups that volunteered thematic description
EZL (n=14)	Swelling and wound	13
	Lesions on body	12
	Disease spread	11
	Limb	8
	Blood vessels	4
	Disease severity	2
	Transmission	1
Musculoskeletal (n=10)	Musculoskeletal change	9
	Locomotion	8
	Food and water	3
	Sweating	3
	Weight loss	1

Colic (n=11)	Rolling	10
	Restlessness	8
	No urination	5
	Work associated	4
	Bloating	3
Coughing (n=10)	Coughing	10
	Loss of appetite/thinner	5
	During/after work cough	3
	Foam and fluid	2
	Cough after eating	2
Lip wound (n=6)	Swelling/wound on upper lip	6
	Reduced water and feed intake	6

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