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HORSE USE AND MANAGEMENT IN UNIVERSITY EQUINE PROGRAMS

A Thesis Presented to the Faculty of the Hutson School of Agriculture

Murray State University

Murray, Kentucky

In Partial Fulfillment

of the Requirements for the Degree

of Master of Science

by Hui Zhao

December, 2017

HORSE USE AND MANAGEMENT IN UNIVERSITY EQUINE PROGRAMS

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Abstract

Horses are utilized in numerous higher education programs in United States. However, there is limited information on horse use, especially in university and college programs. Due to increasing enrollment, greater demand is placed on horse use while institutions are experiencing reduced funding and smaller herd numbers. Thus, this project was conducted to evaluate horse use and management in university and college programs. It was hypothesized that most equine programs over used their horses. A pilot study was conducted to validate the instrument used for the overall study. The survey instrument was created on SurveyMonkey® and released to equine programs (n = 9) in Kentucky for the pilot study in September 2016. After revision, it was released to equine programs in United States for the overall study in March 2017. A total of 19 responses were received from the overall study, and descriptive statistics were used to analyze the data. Based on the results, respondents had some similarities in how horses were used. For instance, most institutions used more than half of their horses in riding and teaching programs; lameness was the most apparent health issue; and most respondents used joint supplements. There were also some differences: pasture acreage varied; horses left programs for different reasons; and the number of students who came in contact with horses was different. However, with the low incidence of health issues and management practices in place, our conclusion was that horses in these programs were not overused.

Keyword: horse use, horse health, higher education, equine management

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Chapter 1: Introduction

Background and Setting

Horses are utilized widely in higher education equine programs all over the United States. However, decreased funding from governments could further impede growth and development of academic equine programs (Johnson et al., 2010) at a time when enrollment is growing (Long and Morgan, 2010; DAS, 2011; Wagner and McCall, 2011). Increased enrollment results in a higher demand for per horse contact hours and has the potential to negatively impact equine health and welfare. At this time, there is limited information available about horse use in universities, colleges or even riding schools. Furthermore, there is no specific instruction guiding programmatic use of horses in higher education.

Statement of the Problem

There are numerous studies reporting the welfare of horses used on farms and for racing but few in college and university programs. Since the potentially increasing workload of horses in college and university programs is a concern, the problem being considered is as follows: How are the horses in colleges and

universities programs being used, how is their health evaluated, and what is the best workload for these horses to maintain equine health while supporting program sustainability?

Purpose

This study was designed to gather baseline data on use and care of horses in university programs in order to later develop guidelines to help equine programs use horses in appropriate ways considering equine health and program sustainability.

Hypothesis

Several studies have shown that the demand for horses contact hours has increased in college and university programs. Thus, it is hypothesized that most colleges and universities are facing the potential problem of overworking horses, resulting in decreased animal welfare and difficulty sustaining equine programs.

Research Questions

The following questions guide the study:

1. How are horses used in university equine programs?
2. What is the typical student:horse ratio and number of contact hours between students and horses?
3. How are horses managed in university equine programs?

4. What are common health issues in horses used in university equine programs?

Delimitations of the Study

This study only evaluated horse use in colleges and universities with equine programs in the United States. Also, the survey was only distributed electronically; no mailings or calls were conducted.

Limitations of the Study

Not all colleges and universities with equine programs will respond to the survey. Thus, responses will represent a sub-sample of the population of interest. Also, some responses may not be complete if some colleges and universities are sensitive about the information being requested.

Assumptions

The following assumptions were made concerning this study:

1. All the colleges and universities which have equine programs would have access to the survey.
2. At least 25% of the colleges and universities would complete the survey.
3. The respondents who complete the survey would answer the questions truthfully and have adequate knowledge to answer questions completely.

Significance of the Study

The results from the study should provide insight to administrators of equine programs on how horses are used in other programs around the United States. Administrators should be able to draw on the information and possibly apply it to their own programs. Additionally, the results may provide information on horse management, which could assist equine programs in ensuring optimal horse health and welfare in their programs.

Operational Definitions

Equine program - University or college programs that include the use of horses, typically to include Equine Science, Equine Management or other emphasis to help students develop professional skills and acquire more knowledge in equine area.

Horse Usage - Frequency of use as well as how they are used for classes, i.e. riding, research, teaching, etc.

Horse Welfare - Relating to the well-being of the horse, including both physical and mental status.

Chapter 2: Review of Literature

Horses have been used for food, work, or transportation for thousands of years, possibly as early as 5000 BC (Brown and Anthony, 2000; Levine, 1999; Librado et al., 2017). Several hypotheses regarding how and why the horse was domesticated have been investigated. Based on genetic analysis, Lindgren et al. (2004) determined that modern domestic horses could be traced back to one foundation stallion, or perhaps to a few closely related stallions having the same combination of alleles on the Y chromosome. This led to the suggestion that domestication through captive breeding may have started when the appropriate male horse, or those related to that horse, were found or obtained by selection. On the other hand, Vilà et al., (2001) reviewed archaeological records and genetic results from mitochondrial DNA (mtDNA) in an attempt to explain equine domestication. Their results suggested that horses were first captured and used for food and transportation over a large geographic area before captive breeding programs were conceived. This theory is backed up by evidence that, based on horse mtDNA mutation rate and the archaeological timeframe for domestication, several distinct horse populations were involved in domestication of the horse (Jansen et al., 2002).

Artistic and textual evidence shows that horses were ridden and used for driving

in the Near East, likely since 2000 BC (Littauer and Crouwel, 1986; Littauer and Crouwel, 2001). Documents like these can give insight into the biogeographical distribution of humans and horses. Analytical methods like population structure profiling have been used to study horse domestication. This method considers the relationships between animals and humans over time (Levine, 2005). Paleopathology, another analytical method, studies ancient diseases which may provide clues to animal domestication (Levine, 2005). For example, tooth wear analysis has suggested that abnormal wear patterns may be the result of bit use in early horses (Brown and Anthony, 1998). Equine bones traced back to 500 to 300 BC were found with abnormalities on their caudal thoracic vertebrae. Compared with horses that wore frame saddles, the abnormal wear patterns suggested that horses were ridden with pad saddles or possibly bareback.

Domestication may have started with the development of equine husbandry (Levine, 2005). As a working hypothesis, Levine (2005) suggest that taming was likely the first step taken to domesticate the horses and was probably a byproduct of hunting them for meat. Horses provide enormous advantages such as long-distance travel, food, trade and warfare to the agriculture society in human history (Warmuth et al., 2012). Early Native Americans, both the North American Plains tribes and the Mongols, were known to capture foals to be used for meat. (Levine, 2005).

Where horses were first domesticated is also a contentious topic. Warmuth et al. (2012) suggested that horse domestication originated in the western Eurasian Steppe.

It is likely that equine domestication originated from the Ukraine, Kazakhstan, Eastern Europe, Western Europe or the Near East. Bit wear found in Dereivka, Ukraine, dating back to 4200-3700 BC, is the earliest evidence for horses use for transportation purpose in the world (Brown and Anthony, 1998; Librado et al., 2017). This is in accordance with Bökönyi's theory which states that the earliest horse domestication took place in Ukraine around 5000-4000 BC (Bökönyi, 1978). As can be seen, evidence derived from different methods has resulted in more than one explanation on the why, how, and where of horse domestication occurred.

Horseback riding has been an important aspect in human history and is still important today. The first horsemanship manuals were Hittite Sankrit tablets relating to the Mitanni master horse trainer, Kikkuli, teaching on horse chariot training, followed by the writings of Xenophon, an erudite Greek soldier who detailed the dressage principles a few centuries later. By medieval times, major differences showed in riding techniques. Until the time of 11th century, three primary concomitant equestrian traditions were established, with the Iranians riding stallions, the Turkish riding geldings and the Bedouins riding mares. After the victory of English light cavalry over the heavier French knights in the battle of Pavia, control of the ridden horse further increased with emergence of the first equestrian academics (Gonzalez and Sutton, 2011). However, with the development of mechanical power in the 20th century, horse populations declined, and their primary use transitioned from transportation, agriculture, and war to recreational or

entertainment purpose (AHC, 2005).

The horse industry in the United States is a key contributor to the country's economy. Considering both indirect and direct spending, the horse industry generates approximately \$102 billion annually, of which \$32 billion is approximately derived from recreational riding (AHC, 2005). Depending on the survey, 10 to 30% of horses are used for competition, while 33 to 42% are used for recreational activities (AHC, 2005; CAFE, 2013). Both competitive and recreational riding styles include Western and English, and these can have subtypes, like rodeo and Dressage, respectively. Horse racing is another event that has long been a major sport in the equine industry and has served as a common pastime for people. Wagering during races has accounted for about one-quarter of the United States gambling revenues (Presterudstuen, 2014; Simmons and Sharp, 1987). An estimated 5 to 19% of horses in the United States fall into the use category "Other", which includes horse use in therapeutic riding programs or for teaching at academic institutions (AHC, 2005; CAFE, 2013). The Greeks were the first to use horse-back riding for rehabilitation of wounded soldiers in approximately 400 BC (Wilson, 1974). Still today, horse-back riding is used to treat a variety of conditions, including stroke, autism and other physical and psychological diseases (Baek and Kim, 2014; Bass et al., 2009).

There is a lack of information specifically on horse use in university programs despite factors that may impact programs and animals. Interest in equine education

and management is on the rise, and Equine Science as a major has been increasingly needed and popular in the United States (Long and Morgan, 2010). North Carolina State University conducted a survey in 2011 of newly enrolled students (n=104) in the Animal Science Department that asked about animal species preferences. Horses were the second most popular animal behind companion animals as the students' first choice (DAS, 2011). A review of the Department of Animal Science at Auburn University concluded that student numbers in the Equine Program increased from 9.2 to 14.9% of total enrollment between 2006 and 2010 (Wagner and McCall, 2011).

As a result of increased enrollment (DAS, 2011; Wagner and McCall, 2011), universities have revised teaching methods in order to respond to student demands. Several universities have set up special equine programs and related extension programs to facilitate equine education. In order to help equine science students scientifically study the industry, Pennsylvania State University established an equine research team in 2008. This team's goal was to teach students to solve equine problems in scientific ways. The research team became an official student organization in 2009, and grew from 10 students in 2008 to over 60 students by 2011 (Stanjar and Macrina, 2011). In an effort to reach non-traditional students, Iowa State University created extension programs, including Master Equine Manager Level I and II, to help horse owners gain more knowledge on horse management and equine care (Auwerda and Miller, 2011a; Auwerda and Miller, 2011b). For helping

students learn more about the industry, Kansas State University conducted a field trip for a physiology class and administered a survey to collect students' perceptions of the experience (Slough and Bormann, 2011). Based on the results, all students said they learned a lot, and that the field trip had influenced their chosen career paths. Michigan State University, University of Minnesota, University of Nebraska, and Iowa State University established equine business education programs. Each state independently hosted a conference concerning liability, business finance, marketing, and insurance for equine business owners. Post-conference surveys showed that many attendees changed their liability contracts, waivers and /or equine insurance as a result of new knowledge gained. Also, some were considering implementing new strategies to improve profitability based on what they learned in the conference (Anderson et al., 2013).

Development of internet resources and websites like eXtension Horses have improved cooperation and education between universities and those interested in the equine industry (Greene et al., 2014), often without requiring the actual presence of a horse. However, many potential employers have expressed their interest in hiring employees with practical horse experience (Jogan and Herring, 2007; Long and Morgan, 2010). This implies that programs with hands-on training may draw more attention from prospective students. Professional associations have also begun educating horse owners. The American Association of Equine Practitioners (AAEP) founded a program of hands-on short courses to help equine practitioners gain the

knowledge of dentistry, equine podiatry and farrier work (Kane, 2012). Tufts Cummings School of Veterinary Medicine developed a combined intern program with Massachusetts Equine Clinic aimed at offering veterinary students better internship opportunities with more practical training and exposure to current techniques used in the industry (Mazan and Merriam, 2009). The veterinary school at Purdue University raised \$3 million to build the Purdue Equine Sports Medicine Center to provide veterinary and veterinary technology students with more hands-on training opportunities (DVM360, 2012).

Despite higher enrollment, many university programs are dealing with budget cuts from the state governments (Mitchell et al., 2017). With decreased budgets and increased enrollment, many equine programs have been seeking more efficient ways to help with program sustainability. Methods have included soliciting sponsorships, applying for and receiving grants, and collecting stall rental fees for boarding student horses (Hovey et al., 2017). Rutgers University started the Young Horse Teaching and Research Program (YHTRP) to offset the budget cuts. This program offered more research opportunities for students and had the potential to generate external funding for their Equine Program by using “at risk” foals from ranches collecting pregnant mare urine (PMU farms). These foals were considered “at risk” due to behavior issues and relatively low market value. Foals were trained and then sold as more desirable potential athletes or pleasure horses, typically generating a profit. Because this program used “at risk” horses, it received more attention from

the media, which led to increased external donations and sponsorships. Most of the students who were involved in YHTRP pursued postgraduate education (Ralston, 2012; Ralston and Molnar, 2012).

Increased demand in educational programs combined with decreasing budgets for the purchase of more horses may result in increased use of animals beyond what is healthy. Horses are susceptible to a variety of health-related issues that may compromise their ability to perform. The most common health issues horses experience includes colic, lameness, and the other ailments like equine influenza and equine herpesviruses (Egenvall et al., 2010; Van Maanen et al., 2003).

Colic refers to abdominal pain caused by many problems mostly involving the gastrointestinal tract, but may also include diseases from other organs which are associated with abdomen such as liver, kidneys and uterus (Traub-Dargatz et al., 2001). Equine colic is the most common equine emergency problem potentially resulting in death and have been estimated to cost the equine industry approximately \$113 million (Bowden et al., 2015; Scantlebury et al., 2014; Singer and Smith, 2002; Traub-Dargatz, et al., 2001). As a national epidemiologic survey showed, the annual colic incidence in the United States was probably 4.2 incidences/100 horses, and the fatality rate was 11% (Traub-Dargatz et al., 2001). Bowden et al. (2015) found that many owners had limited knowledge on normal clinical parameters, which may cause them to sometimes fail to recognize early colic signs and miss the best timing to call the veterinarian.

Based on the study conducted by Seitzinger et al. (2000), lameness has been marked as the costliest disease compared to colic and equine protozoal myeloencephalitis (EPM). Seitzinger et al. (2000) calculated the cost of these three diseases by adding cost of death loss (affected number of horses older than 6 months multiplied by the weighted average number of death caused by disease multiplied by the average sales value of horses in United States in 1998), lost use (horses not being able to be used during treatment and recuperation), veterinary services, drugs and additional care expenses. Results showed that 66% of the cost was attributed to the loss of use of horses (Seitzinger et al., 2000).

The Australian Horse Industry Council (AHIC) and the Horse Emergency Contact Database (HECD) conducted a survey on how a 2007 outbreak of equine influenza impacted the economics of the industry. Affected horses' owners lost an average of \$1000 per week and businesses lost an average of \$3000 per week. All in all, respondents lost almost \$522 million between August and December 2007 (Hoare, 2011). There have also been several disease outbreaks within university programs. An outbreak of equine influenza (H3N8) happened in a riding school. A total of 11 horses were infected in short time period with signs of frequent coughing and high temperature, even though the horses were vaccinated within the previous five months of the outbreak (Van Maanen, 2003). These outbreaks not only affected the use of horses, but have the potential to threaten human health. In a veterinary school in Switzerland, a case of inflammatory dermatophytoses was reported. This

outbreak involved one horse and over 20 students, staff and stablemen (Chollet et al., 2015).

Herpesviruses are ubiquitous. The two families of equine herpes virus (EHV) which cause disease are alpha-herpesviruses (EHV-1, -3, -4, -6, -8 and -9) and gamma-herpesviruses (EHV-2, -5, -7) (Gonzalez-Medina, 2015). Alpha-herpesviruses have latency and short reproductive cycle in sensory ganglia and neural tissue which cause neurologic diseases, while gamma-herpesviruses have latency and long reproductive cycle in lymphoid tissues which linked to corneal and respiratory diseases (Bryans and Allen, 1989). An outbreak of EHV-1 caused neurologic disease in a university equine herd. The outbreak caused 117 infections in 135 horses, of which 46 developed neurologic deficits. Twelve of them did not survive (Henninger et al., 2007). An outbreak of EHV not only causes diseases but also brings extensive economic loss. According to Lunn et al. (2009), the relevant effects of EHV-1 on the horse population are 3-fold. First, but the least economically important, young horses under two years old that showed mild respiratory problems related to pyrexia from the virus led to an interruption of training programs. Second, abortion could occur during the third trimester in pregnant mares. The loss of foals could cause severe economic loss. Third, the neurologic disease could result in death of the horse. Additionally, an outbreak could lead to difficulties for management at training centers or race tracks, disrupting training efforts or competitions (Lunn et al., 2009).

Working equids primarily are used in agriculture and for transportation purposes in many poor and marginalized communities. It is estimated that these equids help approximately 600 million people around the world (The Brooke, 2015). Many of these animals experience a heavy workload, and their welfare is important. A tool called the “Standardized Equine Based Welfare Assessment Tool” was developed to measure the welfare of working equids (Brown, 2012). The tool comprises 40 animal-based measures of relevance to working equine welfare, and some additional data identifiers, and includes evaluation of behavior and various health parameters (Brown, 2012). There are also other guidelines available that help identify signs of positive and negative animal welfare that can then be used to modify equine use and improve overall welfare (The Brooke, 2015). For polo ponies, there is a welfare guide published by the United States Polo Association (USPA) Equine Welfare Committee that defines how to use polo ponies in a game. Violating the rules may result in polo ponies not being allowed to join the game (Dolan, 2015). For horses used in academic and research settings, the Guide for the Care and Use of Agricultural Animals in Research and Teaching (2010) provides details on how to manage horses used in teaching and research purposes. However, there was no description inside this guide defining the horse welfare used in teaching purpose (FASS, 2010).

Horses in university programs must remain healthy in order to contribute to student education. Overuse can lead to poor health, compromising this goal.

Understanding current use of horses in academic settings may help generate recommendations that will support optimal horse health. Based on the aforementioned research, it seems reasonable to believe that a horse use study should be an effective way to assess current practices and potentially contribute to improving horse use in college and university programs. Therefore, the objective of this study was to develop an informational baseline of horse use in university and college equine programs to ultimately help create a guideline on using horses in a proper manner.

Chapter 3: Methodology

This study used a quantitative design in that only quantitative data was collected. The study was conducted in two parts. First, a pilot study was conducted in the state of Kentucky in order to validate the survey instrument. After pilot data was collected, the survey instrument was revised and then released to universities and colleges with equine programs in the United States.

Pilot Project

Instrument selection. A 27 question-survey was established using SurveyMonkey® and included information on horse use, management, and health, as well as student numbers and contact hours. Questions were asked in such a way that responses were recorded as specific numbers or percentages. Participants were also encouraged to provide feedbacks on the survey or express concerns in order to improve the quality of the instrument.

Sampling procedure. Before releasing the survey, a staff member at the Murray State University Equine Center was invited to test the survey to ensure the instrument recorded the responses accurately. The survey was then released to 9 equine programs in Kentucky in September 2016. Respondents were offered six

weeks to take the survey with reminders sent every two weeks in order to generate more responses.

Overall Project

Instrument selection. Results from the pilot study were used to modify the instrument that was then used in the national study. After revision, a 24-question survey was established and sent to equine programs.

Sampling procedure. Survey was released to all equine programs in the United States via emails and National Association of Equine Affiliated Academics (NAEAA)'s Facebook page in March 2017. Recipients were encouraged to forward the survey on to appropriate potential respondents. The survey was closed in June 2017 (May was not counted in the study period due to summer break). Reminders were sent every other week for a total of four times during the study.

Data analysis. An Excel file of the survey data was downloaded from SurveyMonkey.com for data analysis. Descriptive analysis and charts were utilized to showcase data for both the pilot and overall study.

Chapter 4: Results

Pilot Study Results

Four out of nine possible responses were received. Upon evaluation of the data, a few questions were revised. Several questions were consolidated considering the convenience of answering the questions. In order to gain more accurate information, some keywords in the questions were bolded or underlined to remind respondents of the answers' format.

Overall Study Results

It is not possible to determine the percent response rate due to the method of survey distribution. Despite efforts to encourage response to the survey, only 19 responses were received (Table 1), out of over 200 programs estimated. Given the low number, data for this project are being reported as descriptive statistics.

Responses varied for the number of horse numbers reported from 7 to 200 animals, with most programs (7/19) owning 50 to 99 horses (Table 2). Two programs reported less than 10 horses and only one reported more than 120. Most institutions used horses in more than one program, with many institutions using horses for both teaching (17/19) and riding (17/19) (Table 3). Eleven institutions

used 100% of their horses in teaching programs. Six of the institutions used more than 50% of their horses for research and only one used more than 50% of their horses for breeding programs.

Table 1. Horse and student numbers in equine programs ($n = 19$)*

Rank of Institutions	Horse Numbers	Student Numbers	Horse: Student
1	40	45	0.89
2	50	N/A	N/A
3	8	25	0.32
4	40	50	0.80
5	35	200	0.18
6	200	250	0.80
7	50	45	1.11
8	24	65	4.0
9	50	80	0.63
10	83	250	0.33
11	19	30	0.63
12	56	80	0.70
13	56	30	1.87
14	60	120	0.20
15	120	10	12.00
16	40	60	0.67
17	7	25	0.28
18	44	3	14.67
19	108	107	1.01
Total	1090	1475	0.74

*One institution did not answer how many students in its equine program.

Table 2. Number of horses utilized in university and college equine programs ($n = 19$)

Number of horses	Number of institutions
0 - 20	3
21 - 49	6
50 - 99	7
101 - 200	3

Table 3. Horse use in university and college equine programs ($n = 19$)*

Horses used per program (%)	Programs(number of responses)			
	Teaching	Research	Riding	Breeding
0	2	9	2	8
1 - 50	5	4	5	10
51 - 99	1	4	7	1
100	11	2	5	0

*Responses do not total 100% because some institutions used horses in more than one program.

Teaching, research, riding and breeding are the most common programs related to the horse use. Many institutions used more than 50% of horses in teaching programs ($n=12/19$) and riding programs ($n=12/19$). Most institutions used less than 50% of horses in research ($n=13/19$) and breeding programs ($n=10/11$). Eight institutions reported having no breeding program. Additionally, eight institutions mentioned that they used horses in other programs besides the options offered. Two institutions maintained retired horses; three programs used horses in therapeutic riding classes; two institutions mentioned leasing horses; one utilized horses in camps and community lessons for kids; and one institution had horses growing up as replacements for the riding herd.

According to National Research Council (2007), horses working 1-3 hr/wk are regarded as having a light workload. Working 3-5 hr/wk is considered a

moderate workload, and 4-5 hr/wk is a heavy workload. For the convenience of showing the results, moderate workload was combined with heavy workload as the number of hours worked overlapped (Table 4). Horses used for teaching purposes were under a very heavy workload in eight institutions, while horses in the other 11 institutions carried a light to heavy workload. Most institutions used horses in research and breeding programs less than 3 hr (n = 14/19, n = 12/19, respectively). For riding programs, many institutions (n = 10/19) gave horses very heavy workload per week. One institution reported that horses were used 168 hr, but it was not clarified whether the response was for hours per week or per project. For breeding programs, one institution mentioned that the program used horses 102 hr, but again it was not clear if these were hours per week or per season.

Table 4. Individual horse use per week in equine programs (n = 19)*

NRC, 2007	Hours/Week	Programs (number of responses)			
		Teaching	Research	Riding	Breeding
	0	0	7	2	7
Light	1 to 3	6	7	4	5
Moderate	3 to 5 (4-5)	4	0	3	1
Heavy					
Very heavy	> 6	8	3	10	2

*Total number of responses do not equal 19 because horses could be used in multiple programs.

The number of days per week that horses were used in each program varied between institutions. No apparent regular pattern was found in the data. For

institutions with teaching and riding programs, horses were typically used 5 d/wk (n=7/19 and n=6/19, respectively). For research and breeding programs, number of days per week in which horse were used varied from 0 to 7 d, most likely dependent on horses being involved in an active research project or during the breeding season.

Fourteen institutions primarily acquired horses through donations while only one bought all of its horses. Two institutions acquired horses through leasing or use of non-student owned animals. One institution reported acquiring 85% of its horses through its breeding program, and one institution received 50% of their horses from donations and the rest from its breeding program.

Thirteen institutions (68%) only used horses within their equine programs. The other six institutions (31%) not only used horses in equine programs but also provided horses to veterinary school teaching programs, research projects, and extension-related events such as the American Indian Education Center Programming, judging contests, and elementary school field trips.

Respondents were offered four ways to report tracking horse use: daily or weekly written logs and daily or weekly verbal communication (Table 5). Relative to tracking horse use, daily methods (daily written logs and daily verbal communication) were used most among institutions (n=14/19, n=11/19, respectively). In addition to the methods offered, one institution reported using weekly faculty meeting to track horse use and another reported that the barn

manager sent a weekly log of horse use to all faculty members. Another institution noted that they used a semester assignment system to track horse use.

Table 5. Methods universities and colleges used to track horse use in equine programs (n = 19)*

Method	Number of Institutions
Written logs, daily	14
Written logs, weekly	9
Verbal communication, daily	11
Verbal communication, weekly	9

*Eleven institutions used more than one method to track horse use.

Three methods were offered as ways to prevent overuse of horses: daily logs/schedules, verbal communication with all faculty/staff, and having a single person in charge of horses (Table 6). All three methods were used by more than 10 institutions. Apart from the options offered, two institutions used scheduled assignments which had to be approved by all members to prevent horse over use. One institution's horse faculty manager sent weekly emails of horse use to all faculty members. One institution divided horses into different disciplines (hunt, dressage and stock) and each horse could not be used in more than one discipline. Another institution created magnets with each horse's name and tracked horse use on a board; horses were only allowed to be assigned to one class or, which the magnet can only be assigned to one class or one student to prevent over use.

Table 6. Methods used by universities and colleges to prevent over-use of horses in equine programs (n = 19)*

Method	Number of Institutions
Daily logs/schedule	14
Verbal communication	15
Single person in charge	10

*Fourteen institutions used more than one methods to prevent horse over use.

Three student categories were established: beginner, intermediate and advanced. Less than 50% of horses in over 10 institutions were appropriate for each student category (Table 7). Eleven institutions reported less than 50% of horses were appropriate for beginners and intermediate students while eighteen institutions reported less than 50% of their horses were appropriate for the advanced students.

Table 7. Horses that appropriate to be used in each student categories in equine programs (n = 19)*

Horse appropriate to students (%)	Student Categories		
	Beginner	Intermediate	Advanced
0 - 24	7	3	12
25 - 49	4	8	6
50 - 74	5	6	0
75 - 100	3	2	1

*Total percentage of responses may over 100% because some horses are appropriate for more than one student category.

Among the responses, geldings were the most numerous gender (57%). Quarter Horse/Paint/Other stock-type was the most popular breed making up the largest number of 10 institutions' horses, followed by Thoroughbred and Warmblood. A few institutions had Arabians/half Arabians; one institution had 20 Arabians. Other than the breeds offered, Morgan was mentioned by three programs and Standardbred was mentioned by two programs. The average age of horses in University programs was 12 years. Most horses (74.7%) were between 6-20 years.

Fourteen institutions had less than 30% of horses wearing only front shoes, while the other five institutions had more than 60% wearing only front shoes. Eleven institutions reported less than 30% of horses wearing four shoes, while six institutions had more than 60% with shoes all around (Figure 1). Eleven institutions reported less than 30% of horses had no shoes, while in other eight institutions there were over 60% of horses had no shoes.

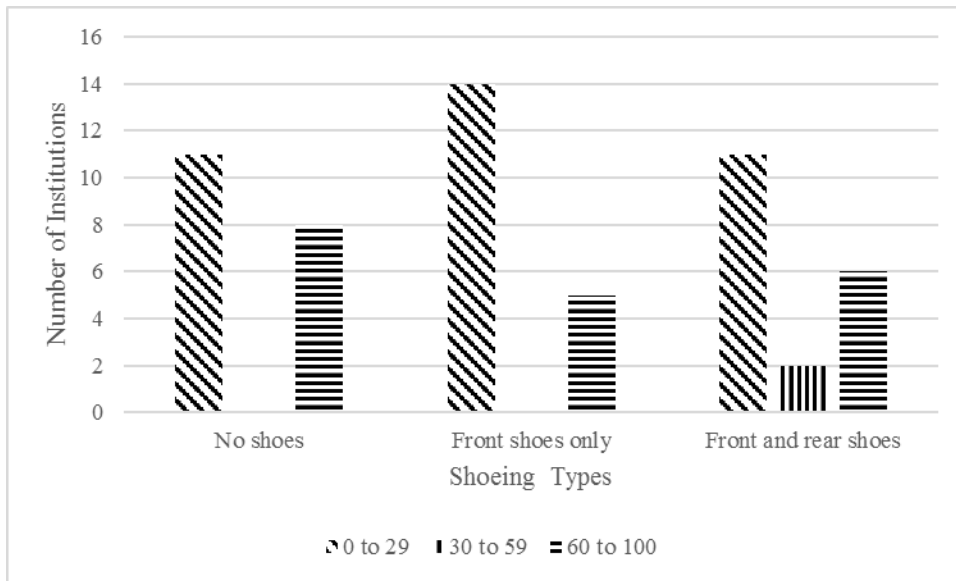


Figure 1. Hoof care and shoeing options used for horses in university equine programs (n = 19).

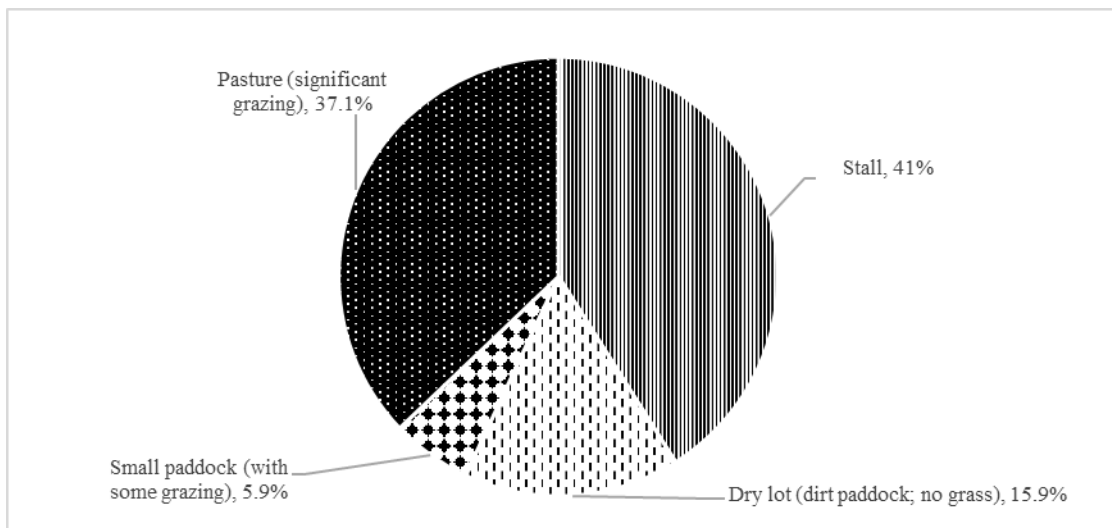


Figure 2. Housing locations for horses used in university and college programs (n=19). Results are reported as mean percentages.

Most institutions (n = 12/18) had less than 50 acres for their equine programs (Table 8). Three institutions had more than 100 acres for their program. One respondent was unsure about the exact numbers due to sharing pastures with other animal species, and one respondent skipped the question.

Table 8. Acres of pasture used in equine programs (n = 19)*

Acres of pasture	Number of Institutions
0 - 49	12
50 - 99	2
≥100	3

*One institution skipped the question, one institution did not give an exact number.

Relative to dispersal, eight institutions reported using horses for less than 5 years in their equine programs (Table 9). Eight other institutions stated that horses would be used 6-10 years. Only 2 institutions mentioned horses were used more than 10 years in their programs, and one institution reported that horses remained with the program until they retired. What they meant by retired was not clear.

Table 9. Average number of years that horses remained in equine programs (n = 19)*

Years	Number of Institutions
0 - 5	8
6 - 10	8
>10	2

*One institution was unsure about the answer.

Institutions were given two choices for the reason why horse left their programs: lameness and behavior issues. Fourteen institutions reported that their horses left the programs due to behavior issue and 15 reported lameness issues. However, other than the choices we offered, horses also left institutions because of old age, retirement, sales, mortality and other health issues.

Student numbers varied between respondents (Table 1). Among all students who had equine majors in these 19 institutions: Eight institutions had less than 40 students; seven institutions had 40-79 students while only four institutions had over 80 students. Most institutions had less than 40 students who minored in equine related majors (16/19) and non-equine majors (12/19) came in contact with their horses (Table 10).

Table 10. Numbers of students in equine major, minor and non-equine major come in contact with horses in institutions (n = 19)

Range of Student Numbers	Major	Minor	Non-equine major
0-39	8	16	12
40-79	7	3	6
≥80	4	0	1

Seven institutions reported between 0 to 49 students contacting their horses at least 30 h per semester (Table 11). Six institutions mentioned 50 to 99 students

and five institutions noted over 100 students who had contact with horses over 30 h each term. One institution skipped the question.

Table 11. Number of students contacting with horses at least 30 hours per semester in institution (n = 19)*

Number of students	Number of Institutions
0 - 49	7
50 - 99	6
≥100	5

*One institution skipped the question.

Student experience in handling horses upon entering equine programs varied. The majority of students (62.9%) had between 1 to 10 years' horse handling experience. Only 15.2% of students had horse experience less than one year, and 13.5% of students had over 10 years' experience on horse handling (Figure 3).

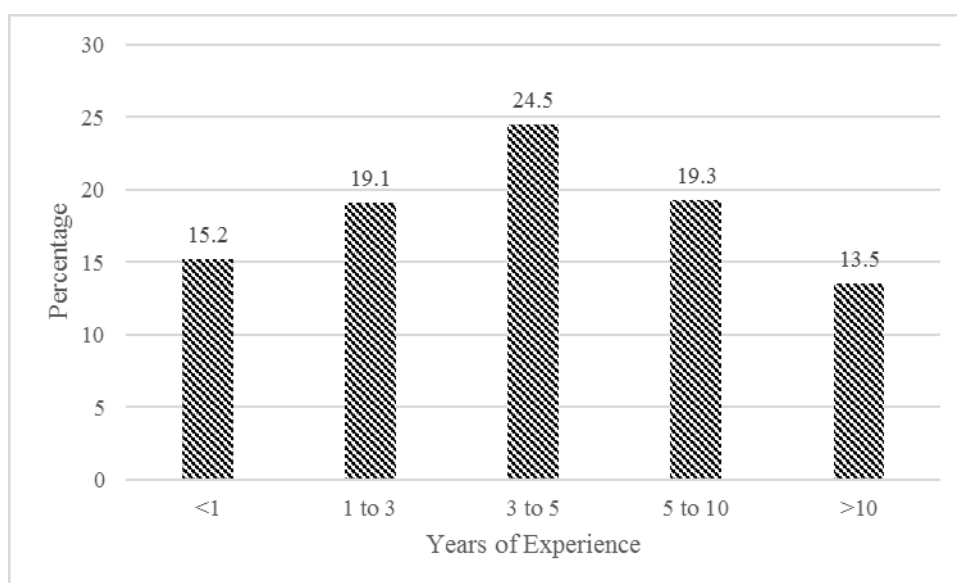


Figure 3. Percentage of students in each range of years on horse handling experience.

Three choices were offered for how often institutions conducted horse health evaluations: daily, weekly and other. Eight institutions' faculties conducted health evaluation for horses daily, while nine institutions conducted weekly. The other two institutions primarily employed staff to check horses, though respondents did not specify the frequency. Relative to the frequency of veterinarians checking horses' health, 12 institutions reported that horses were checked as needed. Four institutions had veterinarians evaluate horses on a semester basis, one had horses checked weekly, and another institution did it monthly. One institution did not mention the frequency but noted that the department chair oversaw veterinary care for all horses.

Five options of health issues were offered: colic, lameness (chronic), lameness (acute), gastric ulcers and abscesses. Other health issues were noted by few institutions (n = 7/19). There were 1090 total horses reported in the survey (Table 1). Chronic lameness, acute lameness and abscesses were the most common health issues (n = 153, n = 122 and n = 121, respectively). Others included skin conditions, sore back, wither rubs, allergies and vaccine reactions.

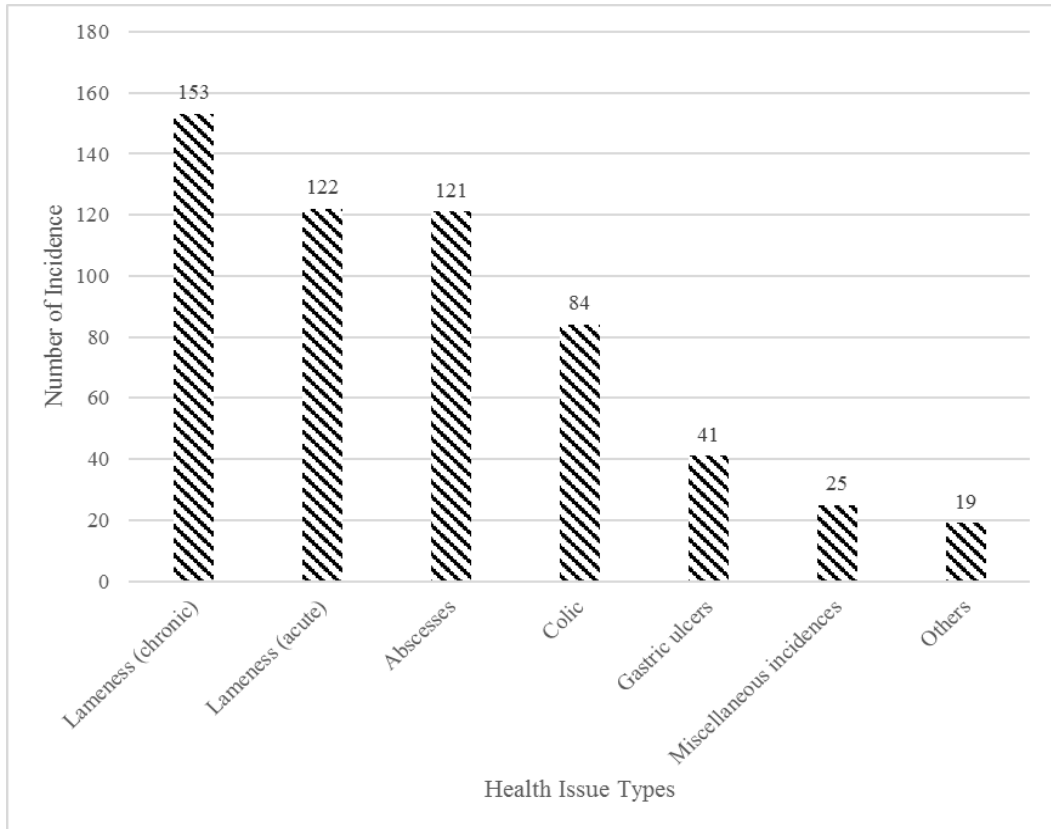


Figure 4. Health issues occurring each academic year in university equine programs.

The numbers of treatments and supplements were the summations of all the responses (Figure 5). The most frequently used supplement was glucosamine, and the most commonly used treatment was joint injections ($n = 199$). Other supplements and treatments included chiropractic adjustment, acupuncture, cold therapy boots, ulcer preventatives and laser treatment.

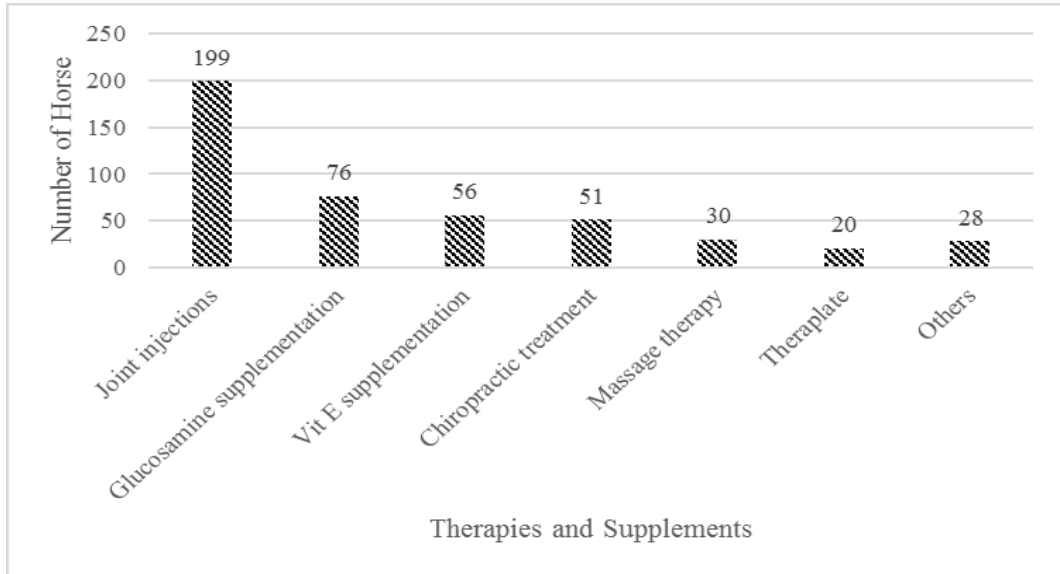


Figure 5. Numbers of horses receiving supplements or treatments in the previous academic year in university equine programs.

Chapter 5: Discussion

The objective of this study was to understand horse use and management in equine programs in higher education. A total of 19 responses were received. Because the survey was released by the founder of Equine Education Network, the total number of recipients was not acknowledged. However, from the website of Equine Science Society, which lists the name of equine programs, it is estimated that there are around 200 equine programs in United States. On the basis of our results, institutions had highly varied horse and student numbers as well as student contact hours. However, results showed that many institutions utilized and managed horses in similar ways.

Most institutions have an animal care and use committee that oversees animal use in research and teaching. Guidelines for most commonly used species are fairly well-delimited, but not so much for horses, particularly those used in riding programs. There are studies and guides on the welfare and use of race horses, polo ponies and carriage horses (Dolan, 2015 Evans, 2007; Gray and Lovat, 2007). However, not many guides were found related to horse welfare in higher education programs. Based on accepted practices of horses (FASS, 2010), there are specific

requirements for harnesses, saddles and other equipment used in teaching and research, but no requirement on equine workload. This means there are no guidelines defining the appropriate workload for horses used in higher education programs. Thus, other information such as horse management, student contact hours and more studies are needed to evaluate and decide what workload would be acceptable.

In this study, individual horses were used 1.3-24 hr/wk, with a mean of 10 hr/wk. However, there was no evidence showing that horse use in a program was related to student numbers or contact hours. This might be because the use of each horse was decided according to its personality, the rider's experience, or program scheduling needs. Using horses in this way would allow the program schedule to be more flexible but may run the risk of over-using certain horses.

Many institutions used most of their horses in riding and teaching programs, while only a small number were used for research or breeding purposes. Teaching riding could be considered an aspect of teaching, but for this project, riding was considered separately from teaching. Classes where horses were used in laboratories for lecture-based classes that may involve some level of riding (e.g., an exercise physiology laboratory) were considered teaching. Horses are mainly used for riding in horse industry, while in higher education, teaching is the main purpose of each program. Therefore, in higher education programs, most horses were used in these two programs. Additionally, riding programs provide students opportunities to enjoy

riding horses and receive college credit at the same time. Moreover, some institutions have equestrian teams which introduce students to a variety of competitions. These competitions offer students precious experience with horses, and may offer prizes that include scholarships and program recognition. This is an excellent way to showcase equine programs to prospective students and potentially increase enrollment. In some universities, equestrian teams compete in the National Collegiate Equestrian Association (NCEA) and may allow the university to offer scholarships to equestrian team members (Robinson, S., Murray State University Intercollegiate Horse Show Association Coach, personal communication).

In addition to the four listed programs, horses were also used for veterinary school education, therapeutic riding and occasional outreach events. For programs which used horse in non-education purpose such as therapeutic riding and outreach events, first, they could earn money from it to increase the program budget to some extent. Second, therapeutic riding and outreach events are also good ways to showcase their equine programs which could increase the enrollment and thus acquire more funding.

Most institutions acquired horses through donations. On one hand, acquiring horses via donation could allow programs to save money on equine purchases. On the other hand, donated horses could have more health issues than horses that were purchased. Although there was one institution that acquired all horses through purchase, which to some extent ensured that the horses were in good health

condition, the cost may be substantial. According to the data, there was no evidence that showed purchased horses were used longer than donated ones. However, the institution which acquired all horses by purchase reported that the program considered using all the horses until they retired, and there were only four health issues reported in that program in the previous academic year. Other than these two ways of acquiring horses, two institutions acquired part of their horses through their own breeding programs. Not only did students gain hands-on experience on equine reproduction and training, but the institution may have saved money by using horses bred by the breeding program (Ralston, 2012; Ralston and Molnar, 2012).

Good management allows for stable horse use, which also ensures high educational quality and keeps horses healthy. Horses in institutions responding to this study were mainly in stalls most of each day (41%) or pasture (37.1%). However, there was no information that showed how much turnout or exercise time was allocated for the stalled horses every day. In a future study, asking how much turnout time stalled horses have each day may provide useful information to measure horse welfare. According to *Guide for the Care and Use of Agricultural Animals in Research and Teaching* (2010), horses were not confined evolutionally. Horses kept in box stalls should receive at least 30 min free time (turnout) or 15 min of controlled exercise every day. Too much confinement can result in behavioral problems such as weaving, cribbing and stall walking (FASS, 2010). In this study, only one institution housed horses in stalls all day. All other institutions reported

giving horses at least one-hour-turnout time each day, implying that horses in university programs receive more than the minimum recommendation for turnout and exercise. Based on horse numbers and pasture acreage reported in the survey, horse to acreage ratios in most institutions (13/19) were less than 1:1. A recommended standard is 1:1-1.5, which means that each horse needs have 1-1.5 acres of pasture as permanent grazing (BHS, 2005). This suggests that university programs are not overstocking pastures as they care for their horses.

Nutritional supplements are commonly added to equine feeds to ensure adequate nutrition and health (Murray et al., 2014). Also, various therapies, such as chiropractic adjustment or massage, can help maintain or improve health. Based on this study, horses were mostly used in teaching and riding programs (Table 3). Energy requirements for exercising horses suggest that horses worked for 4 to 5 hr/wk could fall into a moderate or heavy use categories (NRC, 2007). Thus, horses in this study are likely working harder and longer than the average equine. Providing dietary supplements could help the horse perform better and longer. Use of alternate therapies such as massage and acupuncture may also help the horse recover after exercise, avoiding some health issues (Duberstein et al., 2009; Schoen, 2000).

As for monitoring the horse health and use, most institutions used multiple methods such as written logs, verbal conversations, or having a single person in charge to make sure horses were not over used. At the same time, horses were able to be checked by veterinarians when needed, and checked by faculty either daily or

weekly. However, the Guide for the Care and Use of Agricultural Animals in Research and Teaching (2010) noted that horse health is supposed to be observed carefully at least once a day, and that this could be done during feeding time. In this study, there were nine institutions where faculty did not report checking horses daily. However, based on the phrasing of the question, there is no evidence showing that horses in these institutions were not checked at least once a day by qualified staff. Based on the overall lack of health issues reported in these nine institutions, it appears horses are being evaluated regularly. However, in order to confirm this, more specific questions could be posed in future surveys.

Horses remained in programs from 2 to 15 years, and only a few health issues were reported in the previous academic year. Notable but not surprisingly, chronic lameness was the most frequent health issue reported in the previous academic year. It was also an important reason horses left the program (14/19). Thus, lameness is a big issue for program sustainability. However, there was no previous research found that reported lameness in university program horses. Therefore, more studies need to be done to confirm that lameness is as serious as it appears to be from this study, and to ascertain how equine programs deal with it.

In conclusion, there were low incidences of health issues reported in university equine programs, and horses often remained in programs for multiple years. This suggests that management seemed reasonable and able to keep horses healthy and make their equine programs sustainable. However, based on the low

number of responses from this survey, there is not enough data to judge whether horses were over used in higher education programs. There is no published definition for what indicates over use of horses used in higher education programs to compare these results to. Given the differences in student and horse numbers and use of horses for various purposes, it would be very difficult to assign a number of hours per day or days per week that could be classified as “over use”. In the future, it may be more appropriate to develop a tracking system taking into account the incidence of health issues, length of time in program, or other factors.

Appendix A

Cover Letter

Dear Participant:

My name is Hui Zhao and I am a graduate student at Murray State University working with Dr. Shea Porr. For my final project, I am collecting information on horse usage in American universities and colleges. Because you are in the equine program at your institution, I am inviting you to participate in this research study by completing the linked survey. If there is someone else more appropriate to fill out the survey, please feel free to pass this information on to them.

The questionnaire will require approximately 20 minutes to complete. There is no compensation for responding nor is there any known risk. Copies of the survey data will be provided to my Murray State University faculty chair. Data will be protected and kept secure to ensure confidentiality and anonymity. If you choose to participate in this project, please answer all questions as honestly as possible and complete the survey by May 1, 2017. Participation is strictly voluntary and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavors. The data collected will provide useful information regarding horse use and may assist in developing guidelines to prevent over use of horses and improve horse welfare. If you would like a summary copy of this study, please do not hesitate to email me at hzhao5@murraystate.edu. You may also e-mail my adviser at

cporr@murraystate.edu. If you think there are inappropriate questions, or if you prefer to know more about the survey than just the results, please give me your opinion and suggestions. It is valuable for the study. There will be space in the survey allowing anonymous feedback.

Thank you very much for your time and consideration!

Hui Zhao

Master's Candidate

Appendix B

Survey Instrument

1. How many horses do you have in your Equine program overall? List the percentage that are used in each program below.
 - a. Overall
 - b. Teaching (use of horses for laboratory or other non-riding teaching)
 - c. Research (use of horses for research projects)
 - d. Riding (use of horses for riding classes and equestrian teams)
 - e. Breeding (use of horses for breeding activities)
 - f. Other (list their use and number of horses)

2. On average, how many hours per week is an individual horse used in each program (actual student contact hours)? Please enter a number in each appropriate space.
 - a. Teaching (per semester)
 - b. Research (per project)
 - c. Riding (per semester)
 - d. Breeding (per season)
 - e. Other (please explain and include hours per week)

3. On average, how many days per week is an individual horse used in each program (actual student contact days)? Please enter a number in each appropriate space.

- a. Teaching (per semester)
 - b. Research (per project)
 - c. Riding (per semester)
 - d. Breeding (per season)
 - e. Other (please explain and include days per week)
4. How many students come in contact with horses in your program at least 30 hours per semester (average 2 hours per week, though this may vary)? This may include students who are not Equine program majors. Please enter a number in appropriate space.
5. How many of the students who come in contact with horses in your program fall into the following:
- a. Equine Major
 - b. Equine Minor
 - c. Non-equine major or minor
6. What percentage of students in your Equine program fall into the following categories, relative to their riding or horse handling experience?
- a. Little to no experience (less than 1 year)
 - b. Some experience (1-3 years)
 - c. Moderate experience (3-5 years)
 - d. A lot of experience (5-10 years)
 - e. Very experienced (10+ years)

7. What percentage of horses are acquired from the following resources?
 - a. Donated
 - b. Purchased
 - c. Student owned
 - d. Leased/non-student owned
 - e. Breeding by program
 - f. Other (please explain and include the percentage)

8. Do other university programs (e.g. vet school) use your horses for their program(s)?
 - a. No
 - b. Yes. If yes, please explain what program(s) also use your horses and give an estimate of the number of horses and hours per week they are used below.

9. How do you track horse use in your Equine program? Check all that apply.
 - a. Written logs (daily)
 - b. Written logs (weekly)
 - c. Verbal communication with all faculty/staff (daily)
 - d. Verbal communication with all faculty/staff (weekly)
 - e. Other (please specify)

10. How do you prevent over-use of horses in your Equine program? Check all that apply.

- a. Daily logs/schedules
- b. Verbal communication with all faculty/staff
- c. Single person in charge of horse assignments
- d. Other (please specify)

11. According to horse personalities or behavior, what percentage of horses in your Equine program are considered appropriate for the student categories listed below?

- a. Beginning learners
- b. Intermediate learners
- c. Advanced learners

12. What percentage of horses in your program are shod?

- a. No shoes
- b. Front shoes only
- c. Front and rear shoes

13. How often are health evaluations conducted on the horses by faculty?

- a. Daily
- b. Weekly
- c. Other (please specify)

14. How often are health evaluations conducted on the horses by a veterinarian?

- a. Weekly
- b. Semester basis

- c. Other (please specify)

15. How often do each of the following health issues occur each academic year?

Please enter a number of occurrences.

- a. Colic
- b. Gastric ulcers
- c. Abscesses
- d. Lameness (chronic)
- e. Lameness (acute)
- f. Other (please explain and include the number of occurrences)

16. Where are horses in your Equine program primarily housed each day? Please

enter a percentage for each appropriate answer. The total should be 100% of the animals in your program.

- a. Stall
- b. Dry lot (dirt paddock; no grass)
- c. Small paddock (with some grazing)
- d. Pasture (significant grazing)
- e. Other (please explain)

17. How many horses received the following supplements or treatments in the

last academic year? Please enter a number of horses.

- a. Glucosamine
- b. supplementation

- c. Joint injections
 - d. Chiropractic treatment
 - e. Massage therapy
 - f. Acupuncture treatment
 - g. Other (please explain and include the number of horses)
18. How many acres are used by your equine program?
19. On average, how long do horses remain in your program?
20. Why do horses leave your program? Check all that apply.
- a. Lameness
 - b. Personality/behavioral issues
 - c. Other (please specify)
21. Gender:
- a. Mare
 - b. Gelding
 - c. Stallion
22. Breed:
- a. Quarter Horse/Paint/Other stock-type
 - b. Thoroughbred
 - c. Warmblood
 - d. Arabian/Half-Arabian
 - e. Other

23. Age:

- a. <5 years
- b. 6-10 years
- c. 11-15 years
- d. 16-20 years
- e. >20 years

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