The Effects of Distance on Community Health and Chagas Disease

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ABSTRACT

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The Effects of Distance on Community Health and Chagas Disease

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The primary objective of this research was to examine how the mobility infrastructure and distance to Cariamanga (County capital) from the communities of Bellamaria, Guara, and Chaquizca affected their access to health services and the health of the community. Rather than focusing on quantifying the distance, this study defined distance more broadly in terms of what it meant to traverse distances for healthcare, reflecting an amalgam of time, effort, cost, and availability of transportation considered in the context of existing disease issues in the area. This study aimed to provide a holistic view of the issue through qualitative interviews and geographical observations. Twenty-one individuals from the three communities participated in semi-structured interviews designed to explore various aspects of healthcare accessibility, complimented by four interviews with medical practitioners from the José Miguel Rosillo Hospital in Cariamanga. Results indicated that individuals faced a spectrum of distanced related problems in accessing healthcare that included financial costs, time, effort, and availability of transportation. These factors interact to reduce the likelihood that individuals will travel for healthcare except when children require care or when illness is acute or chronic conditions worsen. Implications for Chagas and other diseases prevalent in the communities suggests that due to the distance-related factors, individuals do not access healthcare when conditions are most treatable due to lack of severity and
recognition of symptom pictures. In more advance stages of disease, access remains hampered with the overall health and productivity of the communities suffering.
This project is dedicated to the participants from communities of Bellamaria, Chaquizca, Guara, and the medical practitioners of the José Miguel Rosillo in Cariamanga. It is their lives and stories, shared with me in this project, that provide the learning produced in this work. I have accurately represented the information they offered to the best of my abilities, and I am profoundly grateful to them.
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INTRODUCTION

Distance as a factor in accessing medical treatment is an important, but largely understudied component in the healthcare system of many countries and regions. While a number of articles discuss some components of distance in relation to healthcare access, their findings are mixed as to whether it constitutes a significant barrier to the prevention and treatment of disease (Zielinski, Borgquist, & Halling, 2013; Kadobera, et al., 2012 Lankila, et al., 2016). In findings from some countries, distance is reported to be a barrier to healthcare that increases childhood mortality and decreases healthcare use in general. In findings from other countries, distance reportedly does not constitute a problem. Compounding the problem of differing findings is the issue of how distance is measured, particularly as it relates to the surrounding environment. More specifically, distance evaluated strictly as a measure of miles/kilometers fails to consider the existing physical, social, and economic conditions involved in traversing those distances.

Thus, it becomes imperative to understand distance more broadly in terms of what it means to traverse distances for healthcare. From this perspective, distance then reflects an amalgam of time, effort, cost, and availability of transportation considered in the context of existing disease issues in the area. This focus on tying a significant disease in an area to the physical and psychosocial difficulties of travel over distances to obtain healthcare is largely absent from the literature. It becomes important to understand how distance as measured through the lives of individuals in specific locations, particularly those encumbered with diseases such as Chagas disease, navigate traveling distances to obtain healthcare. The complexity of traveling distances for medical care is far more
complex than the miles/kilometers traversed. If distance is a barrier to healthcare access, it must be studied and documented as to how and why. The purpose of this study is to explore and present a more comprehensive picture of the difficulty of traveling distances for healthcare in rural Ecuadorian communities where Chagas disease, a potentially life-shortening disease with many symptomatic manifestations, is prevalent.

Chagas disease is a parasitic disease endemic to Latin America. It is estimated to infect approximately eight million people living in the region, many of whom are unaware that they have contracted it (Center for Disease Control and Prevention, 2014). Although Chagas can be found worldwide, it is primarily concentrated in the rural populations of the Americas, particularly Mexico, Central, and South America (CDC, 2013). In Ecuador, as in many of the surrounding countries, it is a disease of poverty, one that is estimated to infect approximately 300,000 Ecuadorians, and cost the Ecuadorian government twenty million dollars per year (Grijalva, 2015). The World Health Organization (WHO) directly links poor housing and working conditions, low salaries, and malnutrition to Chagas disease in Latin America (Lannes-Vieira, Araújo-Jorge, Soeiro, Gadelha, & Corrêa-Oliveira, 2010).

Also known as American trypanosomiasis, Chagas disease is transmitted by the triatomine bug, which commonly carries *Trypanosoma cruzi* (*T. cruzi*), the parasite that causes the disease (World Health Organization, 2015). The vector often lives in the cracks of the adobe homesteads in the rural communities, coming out to feed on the blood of livestock and humans during the night. After feeding on the exposed skin of animals or humans, the triatomine bug defecates near the wound it created. *T. cruzi* is transmitted
through the vector’s feces, allowing for infection if the person scratches or touches the site of the bite.

The disease has three possible stages; acute, indeterminate, and chronic (Spickler, 2009). The acute stage is defined as a period of time when the disease is easily found in the blood of the infected. During the acute phase, approximately 5% of those infected experience any symptoms. When they do occur, acute symptoms include fever, body aches, and swelling, most of which are also common to many other illnesses (CDC, 2014). The chagoma, a swelling of the bite area or the eyelid of the side the bite is known as Romana’s sign, and is the most discernable characteristic of the disease (Spickler, 2009). Following the acute phase, 70% to 90% of patients enter the indeterminate phase, during which the parasites disappear from the blood stream, and no further symptoms develop. The remaining 10-30% of those infected will progress to the chronic phase. The chronic stage of Chagas disease is characterized by organ failure, typically of the heart or the digestive system and, sometimes, neurological complications. Symptoms of the chronic stage include heart failure, megasophagus, megacolon, mega-gallbladder, hepatosplenomegaly, as well as nerve damage and possible dementia. For infants born with the parasite passed congenitally, premature birth meningoencephalitis is a possibility.

According to the Pan American Health Organization (PAHO), Chagas disease largely impacts the Ecuadorian provinces of Loja, El Oro, Manbáí, Guayas, Orellana, and Sucumbios (PAHO, 2012). The disease, however, has been confirmed in eight provinces, including Napo and Pastaza (Guevara et al., 2013). The three communities of Bellamaria,
Guara, and Chaquizca are situated in the southern province of Loja, Ecuador, outside the city of Cariamanga (Grijalva, 2015). Guara and Bellamaria are home to approximately 100 inhabitants each. Chaquizca is nearly double the size of the other two communities with almost 200 inhabitants. Rather than communities they are more considered three distinct neighborhoods, or barrios, of the city. Carimanga is the closest urban center to the communities, some 40 to 80 minutes away, providing them with the nearest hospital, secondary schools, local government and administrative centers, as well as a market. However, these three rural communities all share another commonality, they are all enduring the risk and burden of Chagas disease.

The distance required to travel for medical attention concerning Chagas and other diseases, is something that has received little direct attention. Much of the research concerning the Chagas disease for example, focuses on the vector, poverty, living conditions, and the manifestations of the disease itself. Typically, research cites concerns and data on a national scale, missing crucial provincial level data that offers more specific psychosocial and geographical characteristics of the disease. This represents a major deficit in the literature, potentially obscuring the true scope and impact of Chagas disease in Ecuador.

The rural and impoverished communities of Ecuador also suffer from a burden of unequal distribution concerning health care providers. Both private and public institutions are largely concentrated in urban areas (López-Cevallos & Chi, 2010). One of the most important characteristics affecting rural areas access to health care and utilization is isolation, low population density and the distance between the communities and health
services (Arcury, Preisser, Gesier, & Powers, 2005). The ability to travel such distances for health care is complex and burdensome, and even short distances can become a severe issue.

The purpose of this study was to gain insights into this relatively unexplored area of how traveling distances affects rural health and Chagas disease, as well as other diseases in Ecuador. Rather than focusing on quantifying the distance, this exploratory study sought to gain a holistic view of the issue through qualitative interviews utilizing an anthropological perspective. The objective was to examine how the mobility infrastructure, costs, and distance to Cariamanga, the County capital and nearest medical facilities, from the communities of Bellamaria, Guara, and Chaquizca, affects their access to health services and the health of the community. More specifically, this study sought to examine the implications of what it meant for individuals from the communities to travel for health related reasons, and how it impacted their health, their lives, and ultimately the treatment of Chagas and other diseases.
Access and Distance

Access is considered the most pressing issue for rural health worldwide (Strasser, 2003). Every country faces its own challenges with transportation, communication, and shortages of doctors or health professionals in rural and remote areas. Understanding how a population is affected by their ability access to health services is complicated and highly subjective to their own context. Despite this, many aspects of healthcare access, regardless of the region, are similar. One of the first issues that arises is how access is defined, and by who. In their Bulletin of the World Health Organization, concerning universal health coverage and access, the World Health Organization (WHO) defines access as the opportunity or availability to obtain healthcare services an individual needs and to benefit from financial protection (Evans, Hsu, & Boemra, 2013).

Evans and his colleagues identify three dimensions to access; physical accessibility, financial affordability, and acceptability (Evans et al, 2013). Physical accessibility can be understood as the availability of quality health services within a reasonable distance to those who need them. Financial affordability measures an individual’s ability to pay for health services and takes into account indirect and opportunity costs associated, such as transportation and time spent away from work. Finally, acceptability is an individual’s willingness to seek medical services and is considered low when they believe the services to be ineffective or are discouraged by social and cultural factors.

The subjectivity of access is well recognized by Gabriela Araújo and her colleagues, who examined the equality of access to health care in four countries of Latin
America (Araújo, Caporale, Stefani, Pinto, & Caso, 2011). They define access as the establishment of communication to obtain information or use of an available resource, and as something that varies greatly depending on the perspective from which it is viewed. A patient views access as obtaining quality care, at low to no cost, while a physician may view access as providing care for all of their patients in order to meet their needs.

Distance and transportation are often cited as major barriers for access and utilization of health services (Arcury et al, 2005). While the literature may recognize distance as an important limiting factor or barrier to health care access and utilization, it is rarely explored in depth. Scholarship on transportation in relation to rural health has often focused on emergency medical services and the needs of elderly persons (Arcury et al, 2005). According to Young and her colleagues, issues concerning routine access for rural populations are often ignored (as cited in Arcury et al, 2005).

The availability of a vehicle for travel is critical in a rural setting where the distance to health services or a practitioner is relatively great, and roads are often of poor quality with little public transport available (Arcury et al, 2005). Having the ability to traverse a given distance and terrain is critical in obtaining health care. Without transportation, even a short distance can become a major barrier. Accessibility to rural and remote populations is greatly affected by the physical topography of the area, taking into account whether the area is mountainous, desert, or dense jungle and is compounded by varying climatic conditions (Strasser, 2003). Such conditions often create difficulties
and impose limitations on the availability and frequency of transportation. In some cases, transportation is completely unavailable.

The effect of distance on health is often conceptualized and measured using three methodological frameworks, the Euclidean, Manhattan, and Minkowski distance metrics (Shahid, Bertazzon, Knudtson, & Ghail, 2009). Euclidean distance is straight line measurements from one point to another. This methodology provides simplistic measurements but often lacks truly accurate accounts of distance travel and time. The Manhattan methodology measures distance travelled along grid-like paths with right angle turns, commonly used in large cities like the name would suggest. Finally, Minkowski distance is a general form of distance measurement. It provide a flexible and general methodology which can be optimally defined for the situation and road types.

Time is another fundamental component to the equation (Shahid et al., 2009). Geographic Information Systems (GIS) have greatly reduced the complex and time consuming task of time measurements along road ways. However they do not necessarily reflect true measurements due to a host of environmental, spatial, and temporal conditions. Such consideratons could include the time of day, a weekend vs a weekday, weather, speed limits, road conditions, and so forth. In spatial modeling, Shahid and his colleagues from the University of Calgary suggest using the average travel time, or the Minkowski methodology, in which an ideal value can be chosen to represent travel times in complex travel situations.

While models examining singular transportation methods on networked roads are reasonably suited for urban settings, they are less well suited for patients traveling from
rural or remote locations (Shahid et al., 2009). They utilize several assumptions that pose limitations, such as ideal time and travel conditions, as well as assuming as single method of transportation is used. They also do not take into account a patient who arrives at a medical facility, only to be transferred to another for further care or more immediate emergency care. The condition for which the patient is traveling should also be taken into consideration. A general estimation for a given population cloaks the variability of the need and the urgency for which some patients travel.

The following section is a review of several example studies which examine distance and its relation to specific or general health, while primarily retaining a rural health focus. The review draws on research conducted in North Carolina, Tanzania, Finland, Australia, and Sweden. As previously mentioned, the effects of distance on access to health are highly variable given the environment and socio-cultural setting, as well as available resources, and many of the following studies caution the same. However, they are nearly universal in advocating the broader implications of their findings. The literature review will be concluded with an in-depth look at Ecuador, its current health care system, and its rural health situation. This will provide a comprehensive base of knowledge in which to place context of this study and the individuals’ lives which it portrays.

Example Studies

North Carolina

Dr. Thomas Arcury of Wake Forest University conducted a study in which he examined the relationship of access to transportation with the number of health care visits
for twelve rural Appalachian counties in North Carolina (Arcury et al, 2005). This study used a survey based method for data collection. The researchers found that being older, female, having more education, lower socioeconomic status (SES), and more chronic conditions was associated with being seen for more chronic visits. A similar set of characteristics involving those who were older individuals, women, had more chronic conditions, as well as private/ public insurance, and lower scores on health care measures was associated with more regular care visits. Distance on the other hand, was not significantly associated with chronic or regular care visits.

Transportation was also not heavily associated with the number of health care visits. Receiving a ride from a family member and using public transportation were associated with chronic care visits (Arcury et al, 2005). Participants who reported using family-provided rides had approximately 1.5 times more chronic care visits than those who used did not use public transportation. However, individuals who used public transportation had four times more visits for chronic care than those who did not use this method. Although public transportation was important to a relatively small number of participants, those individuals had qualities that were related to the need for greater care, inability to drive themselves, and access to public transportation. Those who had a driver’s license had over two times more chronic care visits and just under two times more regular care visits, than those without a license (Arcury et al., 2005).

Although distance is a recognized barrier to health care utilization, in this instance distance was not significantly associated with the number of visits. Arcury and his colleagues suggest that distance is an equal barrier within the region, and that distance to
each kind of health care is similar, roughly 10 kilometers (Arcury et al, 2005). In this
case transportation as an enabling factor maybe more significant than distance. Public
transportation in rural communities is not universally accessible, however, and may be
limited to elderly individuals or those with chronic and severe health problems.

There are few studies that directly examine how distance affects a certain medical
concern or issue, such as birth defects. One such study was conducted by Cynthia Cassell
of the CDC and her colleagues. They administered a survey to all known mothers with
children who had orofacial clefts born from 2001 to 2004, as identified through the North
Their aim was to conduct a study that measured geographic barriers to and from
specialized care and the resident’s home. The study examined one-way distance and
travel time, as well as several sociodemographic factors associated with the travel, to
understand when a parent perceived a problem in taking their child for cleft or
craniofacial care.

The study revealed that mothers reported traveling anywhere from zero to 1058
miles, with an average distance traveled of approximately 80 miles (Cassell et al, 2013).
Mother’s with some college education were significantly less likely to go further than 60
miles compared to mothers who graduated college. The age of the child was also
significantly associated with travel distance. Mothers with children two years old were
less likely than those with children age three to travel 60 miles or greater. Income was
also a factor in deciding to travel more than 60 miles for care. The average travel time for
a one way trip was nearly 92 minutes, and once again, mothers with children age two
were less likely to travel over 50 minutes than those with three year old children. Over two-thirds of the respondents claimed that taking their child to receive primary care concerning cleft or craniofacial care was “not a problem”, and while there was no association between travel distance and whether making the trip was considered a problem, mothers who traveled more than 60 minutes were more likely to label it as a problem (Cassell et al, 2013).

**Tanzania**

Daniel Kadobera of the University of Witwatersrand and his colleagues conducted a study examining how the distance to a health care facility effected childhood mortality in rural Tanzania. They argue that barriers to accessing health care remain a serious problem in Tanzania and that geographical accessibility has not been effectively studied (Kadobera et al, 2012). Infant and child mortality is higher in Tanzania for families living farther than 5km away from a health center. The data for the study was taken from a preexisting data surveillance system. The authors utilized the data to examine a rural district in Tanzania over a two-year period. Two measurement methods for distance were utilized, a Euclidean and networked distance measurements. Kadobera et al, (2012) concluded that both infant and under five child mortality rates increased as distance from a health center increased, and that the survival rate increased as children increased in age.

**Finland**

Another study conducted by the University of Oulu in Finland examined geographical distance as a barrier to young adults in both urban and rural settings using Primary Health Care services (PHC) and regular visits to a General Practitioner (GP)
(Lankila et al, 2015). Their study included 74 municipalities, in the provinces of Oulu and Lapland. At the time of the survey, Oulu had a population density of eight individuals per square kilometer, while Lapland had two individuals per square kilometer. Finland also offers universal primary care health services. The presence or absence of distance-related inequity in healthcare use had not previously been examined using a detailed geographical scale.

The majority of their sample resided in urban areas as opposed to rural. Those in rural areas were more likely to be married, have children, fewer with college education, more individuals who were self-employed rather than full time workers, less overall health service utilization and a fewer individuals who self-reported good health or activity limiting ailments (Lankila et al, 2015). Women typically visited the health centers more than men, single individuals less than married ones, and those with children used health centers more than those without.

Overall, the authors found little effect of health service use relating to distance. The only exception to this was the finding that urban residents residing ten kilometers from a health center used health centers more than urban residents living two kilometers or less away (Lankila et al, 2015). The authors acknowledged that many studies report a decline in health service use with increasing distance, and that they expected to find a similar decline in rural areas. In explaining their divergent findings, they suggest that the relatively young age of their participants (age 31) may be a factor, as well as the availability of reliable transportation, a variety of health services, and efficient referral to health services.
Similar to the study conducted in Finland, a group of researchers from the School of Rural Health of Monash University conducted a study examining the reported normal and maximum or upper tolerance of travel time for residents of small rural communities visiting a GP for primary health care (McGrail, Humphreys, & Ward, 2015). They surveyed five rural communities in Victoria and New South Wales, Australia. Two communities had a population density of 4-8 individuals per square kilometer and three with 0.5-1.0 individuals per square kilometer. The first two communities were considered closely settled and had an average distance of 30km to alternative GP outside the communities. The latter three sparsely settled communities had an average distance of 60 kilometers to an alternative GP. All of the selected communities shared five common characteristics. They had at least one resident GP, a population less than 2500 people, were more than 100 kilometers from a large regional/metropolitan center, were demographically similar to other rural communities in Australia, and residents had at least 3 alternative GP choices within neighboring towns.

Their results showed that residents of the sparsely populated area generally already travelled further, about 10 minutes, and were prepared to go farther, roughly 54 minutes vs roughly 32 minutes for those in closely settled areas. Characteristics associated with traveling further included being employed and paid, less than 65 years of age, relying on others for transportation, and having problems with general access or appointments. Overall, it was concluded that access continues to be an important issue in providing healthcare services for those in rural areas.
Sweden

Geographical distance was examined to understand not only the utilization of primary health care services, but secondary health care services, (SHC) as well. The study was conducted using the adult residents of one county in Sweden. Higher numbers of emergency room visits, cost and time spent hospitalized were found to be associated with being female, older, comorbidity, a shorter distance to a hospital, as well as lower education and income levels. The Swedish researchers concluded that the geographical distance and socioeconomic status (SES) were factors in the use of secondary healthcare services (Zielinski et al, 2013).

Ecuador

The health care system of Ecuador has undergone two major restructures with the neoliberalist reforms in the early 1980’s and the election of President Correa in 2006 (Rasch & Bywater, 2014). The early 1980’s saw the implementation of neoliberalist reforms, while government funding for the public healthcare sector was slashed. This neoliberalism movement was also paired with a privatization movement across the country. As a result, the biomedical model became the dominant paradigm for health interventions, which was a perfect fit for privatized institutions relying on highly trained physicians. However, the biomedical model led to a decline in the use of community based and preventative interventions, especially those led by non-medical professionals. While many profit-based businesses benefited from these reforms, ultimately the public
healthcare system fell in to complete ruin. In 2005, Ecuador had one of the lowest health care expenditures within Latin America.

With President Correa’s election in 2006 Ecuador’s health care system underwent another major reform. His platform ran on the concept of creating a Ecuador where every citizen lived the “good life” with one of the main priorities being to provide access to free high quality healthcare for both Ecuadorians and internationals alike (Rasch & Bywater, 2014). The neoliberalism reforms were dismantled and the Ministerio de Salud Publica (MSP) was designated as the primary institution for the restructure. In 2011 the MSP saw a budget increase of $1.6 billion USD, much of which was allocated for infrastructure expansion for increased access, public hospitals, and recruitment of physicians who had left the country. The MSP also adopted tenants of “social medicine,” moving beyond the biomedical model and taking into account economic, social, and political conditions. A 2013 publication by the MSP in Ecuador revealed that in 2012, 38 million individuals received medical treatment, compared to 16 million in 2006 (as cited in Rasch & Bywater, 2014).

Although the national statistics are impressive, the access and quality of healthcare across Ecuador is debated, especially those in rural areas and the community level. A study conducted by Daniel López-Cevallos and Chunhuei Chi of Oregon State University, concluded that health care provider services (both public and private) were equally distributed across the provincial level in Ecuador (López-Cevallos & Chi, 2010). However, 97% of private practice physicians and 96% health personnel work in urban areas. Similarly, 86% of public practice physicians and 88% of public practice health
personnel are employed in urban areas. This indicates a significant concentration of all health services in urban cities and settings, and according to the Ministry of Economic and Social Inclusions, 39% of the Ecuadorian population lives in rural areas (as cited in López-Cevallos & Chi, 2010). The concentration of public practice health personnel was found to have a greater impact on rural households, being positively associated with utilizing preventative care. As a consequence, this creates a double burden on rural areas and communities with unequal distribution and concentration, further limiting access to health services.

A key component to healthcare access that has been consistently identified is the road network which individuals seeking medical care travel on. According to The Association for Safe International Road Travel (ASRIT), the rural roads in Ecuador are often poorly maintained (ASIRT, 2006). Less than 15% of Ecuador’s roads are paved, and are often heavily potholed. The sierra region of Ecuador, which runs through the middle of the country and includes the Loja province where the communities are located, is noted by ASIRT to have roads in poor condition with repair often completed slowly. Not every vehicle is suitable for travel in the region. ASIRT recommends a vehicle with high clearance and good maneuverability as essential (ASIRT, 2006). Mountain roads are frequently covered in fog, and night travel is limited and extremely dangerous because of the road quality.

The quality of the rural care is just as crucial as the access. In a 2013 community based survey of the rural community of La Merecedes, a barrio on the outskirts of the city of Huaquillas in southern Ecuador, 92% of respondents reported using the public health
care system as a primary provider (Rasch & Bywater, 2014). The researchers note that they didn’t find this surprising given the impoverished state of the community, and the inability to pay a private physician. However, only 11% of the heads of households responded positively in regards to the quality of service, and 38% of the response were categorized as negative.

In his article, The Rural Hospital in Ecuador, Dr. David P. Gaus, describes the difficulties he witnessed of people of the rural Pinchincha province and their local outpatient clinic (Gaus, 2009). The small clinic run by the MSP was able to handle most common out-patient conditions and occasional child birth, but it was only open 8am to 5pm, forcing those in need of emergency care to look elsewhere. Dr. Gaus mentions that most MSP rural hospitals cannot function as actual hospitals due to resource limitations of supplies, medication, and poorly trained staff. He reports that if transportation to a clinic could be found, it was three hours to the capital and the nearest major hospital, noting that the patient still might not even be received the upon arrival. While Dr. Gaus was conducting a focus group, he remembers one of the participants saying:

“We need a hospital here, Doc. Our women and children have nowhere to go when they get very sick. It happens more than you might think. And going to the big city is easy for you, Doc, but not for us” (2009, p. 1004).

Those forced to seek medical care outside the rural community, whether because of quality or availability, also experience high cost as well. The Andean Health and Development Department of Quito conducted a study measuring the non-medical cost (NMC) for the residents of La Maná, in the Cotopaxi province of Ecuador (Gaus,
Herrera, Mantyh, Girdhari, & Kuskowski, 2011). The study was conducted the year before (2007) and the year after (2008) of the installation of an MSP hospital. Similar to many other rural areas of Ecuador, few people in La Maná owned a vehicle, with most relying on taxis and public buses for transportation. The cost of transportation, shelter, food, clothing, and two non-monetary measurements of time traveled, as well as days away from home were measured as NMC. Results of the study revealed that after the installation of the MSP hospital in La Maná, the average monetary NMCs decreased from approximately $93 to $12. The mean time spent away from home decreased from 11 days, to only 2 days with the installation of the MSP hospital. A main difference in cost was the dramatic drop in transportation cost from approximately $50 to $4. The authors point out the importance of the distance because of Ecuador’s poorly maintained roads which added significant cost and travel time.

Throughout the literature there is a consistent call for further research on the provincial and cantón level to better understand the current status of Ecuador’s rural health system. What has become clear through this literature review is that the distance required to travel is a significant barrier to obtaining health services for rural Ecuadorian communities. At present, little research has focused on the effects of the distance. Rather, existing studies have only cited it as a barrier to healthcare or noted monetary costs. This exploratory study aims to provide provincial and canton level data that addresses the impact of distance on access to healthcare services.
RESEARCH QUESTIONS

The following research questions were posed to examine different aspects of how the distance from the communities of Bellamaria, Chaquizca, and Guara, to Cariamanga, affected their access to health services and its broader implications on the burden of Chagas and other diseases in the communities.

1. Does the distance from the three communities of Bellamaria, Guara, and Chaquizca to Cariamanga affect access to health services, and if so how?

2. What are the implications, costs, and resources necessary for residents from the three communities of Bellamaria, Guara, and Chaquizca to travel to Cariamanga for health services?

3. How does the distance from Bellamaria, Guara, and Chaquizca to Cariamanga for health services affect Chagas and other diseases in the communities?

It is expected that access to healthcare in these communities will provide information that will be helpful in understanding how people cope with obstacles created by distance and their socio economic status. These issues were explored through analyses of the responses from community members who must cope with travel to obtain health services. Although no questions directly concerning Chagas disease were able be asked due to the sensitivity and stigma surrounding the issue, the responses combined with an understanding of the disease and its possible symptoms, still allowed for the question to be answered.
METHODOLOGY

Theory

The conceptual model that organizes this study is one that integrates components of Torsten Hägerstrand’s Time Geography theory (1982), specifically his concepts of path and project, with an anthropological perspective to examine if and how, distance affects three rural Ecuadorian communities access to health. Time Geography theory has permeated the disciplines of anthropology and public health, making it a suitable theoretical framework from which to examine the research questions. First, within Time Geography, a path can be understood as the set of events and actions that mark a person’s progression through space and time, which is constrained by a multitude of factors (Arcury et al, 2005; Hägerstarand, 1982). These factors can manifest themselves as social and/or physical factors, as well as resources. The second component of the theory, or project, is the compilation of the tasks necessary to complete a certain goal. For the purpose of this study, the common project for a participant from one of the three communities was defined as traveling to obtain health care, receiving that health care, and returning home. The concept of path was slightly altered to fit within an anthropological perspective. Rather than assume any factor affecting a person’s path acted as a constraint, this study re-defined them as influencing factors, or factors identified to have a substantial impact on the participant completing the project. This new definition allowed for factors to range in effect rather than act only as a hindrance.
Setting

The communities of Guara, Chaquizca, and Bellamaria are situated outside the city of Cariamanga, which is the county capital of Cantón Calvas, a rural region in the southern Loja province, of Ecuador (Figure I.) (Grijalva, 2015). Although they are commonly referred to as standalone communities, Guara, Chaquizca, and Bellamaria are technically considered distinct urban barrios or neighborhoods of Cariamanga, as they lie within the borders of the cantón, or county region. The three communities are home to a population of approximately 500 inhabitants. Guara and Bellamaria have roughly over 100 residents each, and Chaquizca is nearly double that size with approximately 200 residents. Elementary level education is provided at each of the communities respective school houses. Cariamanga is the closest urban center, some 40 to 90 minutes away by ranchera (local flatbed trucks with wooden benches), providing residents of the communities with the nearest hospital, secondary education level schools, local government, administrative centers, and market.
The primary route of access to the communities, for both private and public transportation, is a single winding dirt road through the mountains. The road itself is often only wide enough for one vehicle with a sheer cliff face bordering one side of the road, and a steep drop to the side of the mountain bordering the other. The condition of the road varies due to heavy erosion from rain during the winter months and little
consistent maintenance. The road often becomes impassable due to flowing water or landslides. Bellamaria is the furthest barrio from Cariamanga requiring approximately an hour and a half by vehicle, followed by Chaquizca at approximately 1 hour, and Guara being the closest at about 40 minutes of travel to Cariamanga.

The communities are not centralized around a specific point, partially due to the mountainous topography. Each community’s elementary school could be considered to act as a central point of the community. However, homes of the communities are often spread far apart along the surrounding ridge lines and hills, with few roads or paths connecting them. Many of the roads and paths that do connect the homes are severely eroded and poorly maintained, often making vehicular travel impossible past a certain point for many of the roads. Few residents in the communities own a personal vehicle, often relying on donkeys or horses for transportation and carrying loads. Within each community there appears to be at least one individual with a truck that residents can depend on for help with travel if needed. However, there is still an expectation of payment for that assistance. Many residents rely on agricultural work and raising livestock for subsistence and income, which can be highly variable depending on the season. Some residents grow and maintain their own fields and livestock, while others aid neighbors with their tasks and receive payment in exchange for their labor.

Sample and Data Collection

Data collection took place over a three week period during the month of June, 2015. The research protocol was approved by the Ohio University Institutional Review Board in Athens, Ohio. Participants were asked to participate on a voluntarily basis in
semi-structured interviews focusing on how travel distance impacted their access to medical care and its associated cost, resources, and implications. All participants were fully informed via the informed consent process prior to participation in the study and guaranteed anonymity. No identifying information was collected. Demographic data including age, gender, and the community in which the participant resided was obtained. The interview and consent process were conducted in Spanish with the assistance of a translator who was fluent in both English and Spanish. Questions were asked in Spanish, and participants responses were translated to English for the primary investigator. All interviews utilized the same set of questions, and follow up questions were used for clarification. Due to the sensitive nature of the subject, no information directly concerning Chagas, other diseases, or medical information were obtained from participants unless volunteered first. Follow up questions were only asked if the participant was willing to speak further on the issue.

A total of 25 interviews were completed, with 10 participants from Bellamaria, 6 from Guara, and 5 from Chaquizca, as well as 4 medical professionals from José Miguel Rosillo, the hospital in Cariamanga. A total of 11 males and 14 females were interviewed, with a breakdown of four males and two females from Guara; one male and four females from Chaquizca; two males and eight females from Bellamaria; and all four medical professionals were male. All participants were selected at random based on who was available to speak at the time of the visit and what homes could be reached in a single day. Only one adult from each homestead was interviewed. In one instant, both the husband and wife participated in the interview process at the same time. However, the
interview was only counted for the husband due to the wife’s lack of response to the interview questions.

The majority of the interviews with community members were conducted on the front porch of resident’s home, an area central to their everyday life. Interviews lasted from 7 to 40 minutes in length. Three participants interviewed in Bellamaria, actually resided in Cariamanga. However, given their status as teachers, they were considered community members and they still made the same commute from Cariamanga to Bellamaria during the week and expressed similar health concerns as other residents. A secondary questionnaire was included for participants who owned a vehicle. The four interviews conducted with medical professionals from the Cariamanga hospital focused on their perceptions of how the distance affected access to health care for individuals from the three communities. These interviews utilized a different and shorter questionnaire, but followed the same procedure as the community participant interviews.

Observations of the physical mobility infrastructure, including road quality and transportation methods were compiled to provide complementary data. These observations were documented through daily field notes and pictures. Roads inside and outside the communities were traveled by car and on foot. Not all roads were able to be documented due to time and travel constraints. However the main road leading from Cariamanga to the communities and the immediate roads inside the communities were thoroughly observed.

After each session in the field, all data gathered was transferred to a laptop hard drive and an external hard drive. All field notes were immediately electronically
transcribed into Microsoft word documents, and each interview was given an identification code. All photographs were taken with a high resolution digital camera and were coded for date and location. Initial transcription of the audio files were completed by the primary investigator with the aid of a translator, and complete Spanish transcriptions were later completed by a member of the research team.

Analysis

Due to the exploratory nature of this study no pre-existing themes were considered to avoid creating an unintended bias toward answering the research questions. Following the design of the study, themes were identified in response to commonalities among participant’s responses, and the frequency with which they re-occurred. Separate sets of themes were extracted from community member’s interviews compared with medical practitioners, but followed the same vein of logic. Both sets of themes and their corresponding responses were placed in excel spread sheets to create a comprehensive and condensed data layout.

To examine the identified factors within the context of a paths and projects theoretical frame work, a “profile” was created for each community member. The profiles were headed the respective interview code and corresponding excel sheet number, as well as the common identified project. Once again, the common project in this study was defined as a member from one of the three communities traveling for and obtaining health services, then returning home. Underneath the heading were listed the three contextual factors and fourteen influencing factors for each participant, with a sidebar along the margin including all relevant terms and definitions.
The profiles themselves served as tool to facilitate comparison between the participant’s responses, as well as to illustrate what a potential path for a participant to complete the given project may involve. There is no standard form of measurement or analysis for Time Geography, although there have been several attempts to suggest a standard format. However, the theory’s original interpretation remains ethnographic and descriptive in nature. The profiles are not an attempt to offer a standard format of analysis, but rather to act as a tool in formatting Time Geography’s original narrative-like method of explanation. No profiles were created for the medical practitioners as their responses pertained to community members and not their own experience in obtaining health care.
RESULTS

Participants

The average community member participant in this sample was 46 years old and typically female. However, participants ranged in age from 25 to 85 years of age, with a male age range of 32 to 85, and a female age range of 25 to 60 years old. They lived in a household composed of the participant and three to four other individuals per home (range of one to eight). Few homes consisted of relatives outside the immediate family (father, mother, son, daughter) living with them. Approximately 85% (n=18) of the participants lived with a partner or spouse and roughly 62% (n=13) of participants had two or more children living with them. Participants often mentioned that they had other children who were either living in Cariamanga for school or in larger cities and were married or working. The average length of residency for a participant in their respective community was slightly over 30 years, and many had lived there since birth. *Table 1.* provides a detailed breakdown of the demographic and contextual factors examined.
Table I. Aggregated Dimorphic Information and Contextual Factors Identified for Community Member Participants of Bellamaria, Guara, and Chaquizca

<table>
<thead>
<tr>
<th>Item</th>
<th>Males:</th>
<th>Females:</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>33.33%</td>
<td>66.66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>46.39 years old</td>
<td>25-85 years old</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residency</td>
<td>30.53 years</td>
<td>10-64 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Composition</td>
<td>4.52 persons</td>
<td>1-8 persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method(s) of Income</td>
<td></td>
<td></td>
<td>Agriculture: 71.43%</td>
<td>Teacher: 14.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Livestock: 61.9%</td>
<td>Other: 23.81%</td>
</tr>
</tbody>
</table>

*all decimals rounded to the nearest hundredth * all percentages taken from a total #(n) of 21 unless specified

The primary form of income generation was agricultural work, with the participants reporting that they tended to their own crops, or helped with others. This method of income was followed closely by raising livestock. Agricultural and livestock work served not only as methods of income, but subsistence for many. Participants typically grew what they could to sell at the local market in Cariamanga, keeping some for themselves and supplementing their diet with supplies purchased from the city. Many raised pigs, chickens, and goats, although few larger livestock, such as cows and bulls, were uncommon. The majority of participants reported that they worked in both agriculture and livestock to support themselves. Few participants reported only one method of income. Two reported working in agriculture, three were local elementary school teachers, one was unable to work, and one received retirement from the government as there only source of income.
Identified Themes

Three themes were identified as important standard contextual information, or contextual factors, for each community participant. Those three themes are Residency, Household Composition, and the participants Method(s) of Income. Twelve other categories were consistently cited by community participants, and were considered factors that could directly influence their desire, efforts, or ability to travel for medical care. The categories were termed influencing factors and included Vehicle Ownership, Frequency to Cariamanga, Travels Alone or With Others, Others Identified As, Principal Mode of Transportation, Travel Cost, Travel Time, Identified Institute(s) of Health Care, Project Duration, Medical Ailments, Emergency Situations, and what a participant would do In Case a Doctor is Unavailable. The first seven categories are conceptually organized around influencing factors concerning travel, which can be further broken down into travel characteristics and transportation, followed by the reaming five categories which directly concern participant’s health. The medical practitioner’s responses shared five common themes in their response. This set of themes included, Frequency of Visitation, Health Issues, Appointments and Admittance, Emergency Services, and Perceived Challenges. A complete list of themes and definitions can be found bellow in Table 2.
**Table II. List of Factors and Definitions.**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contextual Factors</strong></td>
<td></td>
</tr>
<tr>
<td>Residency</td>
<td>The reported number of years the participant has been living in the community.</td>
</tr>
<tr>
<td>Household Composition</td>
<td>The reported total number of residents living in the participants home at the time of the interview. The relationship to the participant is listed if known.</td>
</tr>
<tr>
<td>Method(s) of Income</td>
<td>The reported method(s) the participant utilized to earn a living.</td>
</tr>
<tr>
<td><strong>Influencing Factors</strong></td>
<td></td>
</tr>
<tr>
<td>Travel Related Factors</td>
<td></td>
</tr>
<tr>
<td>Vehicle Ownership</td>
<td>Whether a participant or family member reported owning a vehicle of any kind.</td>
</tr>
<tr>
<td>Frequency to Cariamanga</td>
<td>The reported frequency of the participant traveling to Cariamanga, the nearest city offering medical care providers.</td>
</tr>
<tr>
<td>Travels Alone or With Others</td>
<td>Whether the participant reported typically traveling to Cariamanga alone or with others.</td>
</tr>
<tr>
<td>Others Identified As</td>
<td>The reported identity of others typically traveling with the participant to Cariamanga if the participant indicated they typically traveled with others.</td>
</tr>
<tr>
<td>Principal Mode of Transportation</td>
<td>The most commonly used mode of transportation to Cariamanga by the participant.</td>
</tr>
<tr>
<td>Travel Cost</td>
<td>The reported one ways cost of traveling for medical care, in USD, of a given mode of transportation from the participant’s community to Cariamanga or other identified location. Round Trip cost were arrived at by doubling the reported one way cost.</td>
</tr>
<tr>
<td>Travel Time</td>
<td>The reported amount of time, recorded in hours, needed by the participant to travel from a point of origin to a point of destination. Round trip travel time was calculated by doubling the reported one way travel time. <em>(This does not include time spent conducting an activity, only the time a participant spent physically traveling)</em></td>
</tr>
<tr>
<td><strong>Health Related Factors</strong></td>
<td></td>
</tr>
<tr>
<td>Identified Institute(s) of Health Care</td>
<td>The reported institute(s) of health care provider the participant reported using. This can be further broken down in to 2 sub categories; *Location: the city, town, or community, where the reported institute of health care is located; and *Institute: the given name or kind (hospital, private clinic, etc) of the health care provider.</td>
</tr>
</tbody>
</table>
Table II. Continued

<table>
<thead>
<tr>
<th>Medical Practitioner Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of Visitation</td>
</tr>
<tr>
<td>Health Issues</td>
</tr>
<tr>
<td>Appointments and Admittance</td>
</tr>
<tr>
<td>Emergency Services</td>
</tr>
<tr>
<td>Perceived Challenges</td>
</tr>
</tbody>
</table>

Community Member Results

Of the twenty one community members interviewed, four participants reported owning a vehicle, one owned a truck, and three owned motorcycles (Table III.). Although these were the only vehicles owned directly by participants, many alluded to the fact that there was at least one individual in each community who owned a truck. It important to note that it had recently become illegal for an independent driver to transport people or goods for money. Members of the local transportation in Cariamanga were the only licensed individuals to transport others. If an individual was caught breaking the law,
they could be heavily fined. Those with a vehicle typically used it daily, mostly for inter-community travel. The single participant with the truck drove to Cariamanga daily to take his children to school. Most participants did not express much concern with the cost of gas, saying that it only cost about three dollars to drive either a truck or motorcycle on a given day. That cost is roughly equivalent to a round trip to and from Cariamanga by ranchera. Participants who reported owning motor bikes said that if they were going to Cariamanga, they usually took the ranchera because the whole family would go. Three participants reported having used their vehicle to take someone to the hospital before. In one instant, the owner of the truck was transporting a woman who was about to give birth, and they were forced to stop along and have community members help deliver the baby.
**Table III. Comparison of Aggregated Travel Related Influencing Factors Identified for Community Members Concerning Travel Characteristics and Transportation**

<table>
<thead>
<tr>
<th>Item</th>
<th>Vehicle Ownership:</th>
<th>Frequency to Cariamanga:**</th>
<th>Travels Alone or With Others:</th>
<th>Others Identified As:</th>
<th>Principal Mode of Transportation:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes: 19.05%</td>
<td>Lived in Cariamanga: 15.00%</td>
<td>Alone: 38.09%</td>
<td>Spouse:</td>
<td>Ranchera: 52.38%</td>
</tr>
<tr>
<td></td>
<td>No: 80.95%</td>
<td>1 - 2 Times a Month: 25.00%</td>
<td>Alone or With Others: 19.05%</td>
<td>Parents:</td>
<td>Personal Vehicle: 4.76%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Every Day: 5.00%</td>
<td>With Others: 42.86%</td>
<td>Neighbors:</td>
<td>Ranchera or Truck: 28.57%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 4 Times a Month: 55.00%</td>
<td></td>
<td></td>
<td>Truck: 14.29%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*all decimals rounded to the nearest hundredth *month is defined as every 30 days *all percentages taken from a total #(n) of 21 unless specified
**percentages taken from a total #(n) of 20, due to one participant never reporting their frequency

The majority of community participants reported travelling to Cariamanga anywhere from two to four times every month. This study defines a month as every 30 days. The trips generally revolved around 8, 15, or 22 day cycles, and participants frequently reported going to Cariamanga on Sundays, as well as Mondays and Wednesdays. Only one participant reported going to Cariamanga every day. However, this was the same participant who owned a truck. The three teachers all live in
Cariamanga, but made the daily commute Monday through Friday, from Cariamanga to the community they taught in. Community members rarely traveled to Cariamanga for a single purpose. Due to the limited number of times participants reported visiting Cariamanga, community members would often attempt to accomplish three or four different tasks while in the city. This usually entailed buying or selling crops and supplies, obtaining official documents, participating in local organizations, and seeking medical care for themselves and/or their children. If participants intended to sell crops or bring supplies back with them on the ranchera, they not only have to pay the fare, but be charged an extra fee for extra items they carry with them, or not be allowed to ride at all and pay for a truck.

Community members were almost equally divided on whether they would often travel alone or with others when they went into Cariamanga. Those who often went with others, would generally go with their spouse or their children. Children often went with their parents when they were sick and needed a medical appointment or when there was no one to take care of them while their parents were gone. Participants who reported travelling alone expressed that they did so because their spouse either could not go, or would stay home and take care of their children and their animals. Others cited that they would often not go together to help reduce the cost of the trip.

Transportation options for community members were generally limited to two choices. Participants could choose to either take the ranchera or a truck into the city. Roughly 80% of participants reported relying solely on the ranchera, or a combination of the ranchera and a truck available to them as their primary mode of transportation. The
ranchera operator resided in Bellamaria and only made one trip per day into Cariamanga. The ranchera would departing at five in the morning and return at three in the afternoon. It would make a stop at each community along the way, starting from Bellamaria, continuing to Chaquizca, and finally Guara, before it reached Cariamanga. As the ranchera traveled from community to community, it tended to fill up very quickly and picked up people up along the road as it went.

Due to the limited number of seats on the ranchera, about 25, and the limit on what a community member was allowed to take with them, the residents of Chaquizca, and particularly Guara were placed at a disadvantage, with the ranchera often filling up before it arrived. For those who lived far from the road, this also meant that they needed to wake up very early and walk down to meet the ranchera. Some participants reported needing the assistance of donkeys if they had had trouble walking or needed assistance in carrying crops and goods. On the occasions that community members missed the ranchera or were not allowed to take their goods, they either had to decide not to go, or to find a truck to take them to Cariamanga.

Participants who reported using trucks generally had one of three options. They could call for a truck from the local Transpiration Cooperative in Cariamanga to come and take them, rely on a neighbors or relative’s truck, or use their own vehicle. Although a truck allowed for a more flexible travel schedule, the cost was reported to be much greater than the ranchera. If a participant called for a truck from the city, they would need to wait for it to reach them up, and then take them into the city. The practice of riding in a neighbor’s truck used to be far more common. The local law had recently changed before
this study was conducted, and it now prohibited individuals not associated with the transportation cooperative to transport others for profit. This did not completely stop community residents from doing so, however, if they were caught they would be penalized with a hefty fine. Trucks are important vehicles however, because they are the only method of transporting goods and supplies that can’t be easily taken on the ranchera. Trucks with 4-wheel drive are also the only vehicles suited for traversing many of the roads, particularly in the rainy season where flooding and erosion makes the roads hazardous.

In examining the cost of transportation, the average overall one-way cost of the ranchera for the communities was calculated to be $1.44 (Table IV.). This average is a slightly misleading figure however, because the price varied greatly for the distance from each community. Participants from Bellamaria reported paying the most, typically about $1.75 per ride. Residents of Chaquizca consistently reported paying $1.25 per ride, and Guara was the lowest at $1.00 per ride into Cariamanga. This figure is also per person, so if two or three family members traveled to Cariamanga at the same time, the cost was then multiplied. The charge for young children was explained to be dependent on their age, reportedly anywhere from ₡.25 to ₡.50 if they were young. The exact charge for carrying items on the ranchera was never fully discussed, but community members did explain that it was usually based on the weight of the items they had with them. A round trip cost for a participant could be anywhere from two to four dollars if they were travelling by themselves and didn’t carry anything extra. However, many of the participants often reported travelling with their spouse or their children. This meant the
typical cost for a family was more accurately around two to four dollars one way, add perhaps included an extra dollar for two children, bringing the possible total to three or five dollars. Thus, a round trip cost could easily have reached $10.00 for a single family.

Table IV. Comparison of Aggregated Travel Related Influencing Factors Identified for Community Members Concerning Cost and Time

<table>
<thead>
<tr>
<th>Item</th>
<th>One-way Costs:</th>
<th></th>
<th>Round Trip Costs:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mode</td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>Ranchera</td>
<td>$1.44</td>
<td>$1.75</td>
<td>$1.00 - $2.00</td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td>$7.43</td>
<td>$10.00 &amp; $2.00</td>
<td>$0.00 - $25.00</td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>$5.17</td>
<td>n/a</td>
<td>$1.00 – $10.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.88</td>
<td>$3.50</td>
<td>$2.00 – $4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$14.86</td>
<td>$20.00 &amp; $4.00</td>
<td>$0.00 - $50.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$10.34</td>
<td>n/a</td>
<td>$2.00 - $21.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>One-way Travel Time:</th>
<th>Round Trip Travel Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cariamanga</td>
<td>1 hour 10 mins 1 hour</td>
<td>2 hours 20 mins 2 hours</td>
</tr>
<tr>
<td></td>
<td>45 mins – 2 hour</td>
<td>1 hour 30 mins – 4 hours</td>
</tr>
</tbody>
</table>

*all decimals rounded to the nearest hundredth *all cost reported in USD *all time measured in hours

The cost of a truck in most cases was reported to be far more expensive than the ranchera, and did not seem to vary by distance from any of the communities. On the most expensive end of the spectrum, a cooperative truck from the city was reported to cost $25.00 for one way trip, whereas most neighbors charged around ten dollars a trip if they were transporting someone. Considering these amounts, a round trip could potentially cost a community member $50, if they relied on a truck. In some cases, trucks were
actually less expensive or nearly equal to the ranchera. One participant reported that they were not charged anything to ride in a truck because they were a relative of the owner. Others reported being charged about two dollars for a one way trip because of their acquaintance with the driver. In the case of the participant who owned a personal truck, it was reported that it cost him roughly $3.00 in gas for driving in a given day. If he were to transport someone and charge a similar fee to what had been reported, the participant would make a profit of about $7.00.

One other form of transportation had recently became available to the community members just before the beginning of this study. A bus route had been recently added which traveled to the three communities. Only one participant seemed to be familiar with it and reported that it cost about the same as the ranchera did if you were leaving going from Guara, one dollar one-way. While this bus had only started about a week before interviews began, busses were commonly used to travel outside of Cariamanga. The buses typically arrived in and departed from Cariamanga’s town square. Participants frequently reported using them if they needed to travel for more specialized medical care, unless an ambulance was transporting them. The cost varied by distance, for instance costing $4.00 for a ticket to Loja or $10.50 for Guayaquil. While the cost of a bus is more infrequent than a ranchera or truck, this cost is always compounded by the cost of the time and money it takes for a community member to get into Cariamanga.

Regardless of the mode of transportation or cost, the average time from the communities to Cariamanga is around one hour and ten minutes, and the average total time of round trip travel is around two hours and twenty minutes. Although the amount of
time spent travelling from Chaquizca and Guara to Cariamanga was consistently reported below this average, it was found to be more accurate than not. Many participants explained that it took between certain ranges of time for them to travel to Cariamanga from their respective community. So as to not create a bias average in favor of the maximum time possible, the lowest reported time was factored into the statistics above. Participant’s frequently expressed that the reasons it could take longer included the ranchera picking people up along the way, as well as adverse road conditions. Another possible factor that was observed during the field work was that many vehicles, especially those of greater size, would reach a point in the road where they could not pass each other, the ranchera being slightly wider than the average pickup truck. In this type of situation, one vehicle would be forced to reverse to a location until a location was reached where the other vehicle could pass it safely.

Considering these factors, which add additional time, the actual average travel time from Bellamaria differs the most from the overall average. Bellamaria was consistently reported to take an hour and a half to travel to or from one-way, and the reports were confirmed by time measurements taken in the field. Although the residents of Bellamaria have the advantage of the ranchera departing from their community first, they incur the highest costs, in addition to spending the most time travelling for any given reason. A normal trip could easily mean participants from Bellamaria spend three to four hours simply traveling.

When traveling for medical care in Cariamanga, the average participant, by themselves, could expect to spend roughly three dollars on transportation, and roughly
two and a half hours traveling. However, since many participants reported traveling with their family, the average cost increases with the number and age of family members, although there is no change in the overall travel time. This is important because 100% of community member participants reported traveling to Cariamanga for medical care. Approximately 81% of participants reported utilizing the José Miguel Rosillo Hospital, 33% visited private clinics, and 14% used Seguro Social, a local social security clinic (*Table V*). Other participants utilized a medical social security center in the nearby town of Chiriguara, called Seguro Campisino, which was roughly ten minutes from Cariamanga. Seguro Social and Seguro Campisino, are both social security forms of medical care with some specific centers for each one. Participants who utilize Seguro Social, obtain it though their employment. Essentially, their occupation covers their medical cost because their employer pays into it. Seguro Campisino is a form of social security medical coverage for individuals residing in rural areas. The head of a household pays roughly eight to ten dollars a month to cover medical care for their entire family.
Table V. Comparison of Aggregated Health Related Influencing Factors Identified for Community Members

<table>
<thead>
<tr>
<th>Item</th>
<th>Identified Institute(s) of Health Care:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-Location:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cariamanga: 100% Loja: 23.81%</td>
</tr>
<tr>
<td></td>
<td>Chiriguara: 14.28% Catacocha: 14.28%</td>
</tr>
<tr>
<td></td>
<td>Machala: 4.76% El Tambo: 4.76%</td>
</tr>
<tr>
<td></td>
<td>Quito: 4.76%</td>
</tr>
<tr>
<td></td>
<td>-Institute:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital: 80.95% Private Clinic: 33.33%</td>
</tr>
<tr>
<td></td>
<td>Seguro Social: 14.28% Seguro Campisino: 9.52%</td>
</tr>
<tr>
<td></td>
<td>Maternity House: 4.76% Herbetero: 4.76%</td>
</tr>
</tbody>
</table>

Project Duration:**

1 day or less: 58.33% More than 8 days: 8.33%
2 – 8 days: 33.33%

Medical Ailments:

<table>
<thead>
<tr>
<th>Ailments</th>
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</thead>
<tbody>
<tr>
<td>Rheumatoid Arthritis</td>
</tr>
<tr>
<td>Gastritis</td>
</tr>
<tr>
<td>Osteoarthritis</td>
</tr>
<tr>
<td>Paralysis</td>
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<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Joint Pain</td>
</tr>
<tr>
<td>Blindness</td>
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<tr>
<td>Removal of Appendix</td>
</tr>
<tr>
<td>Stomach Pain</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Tape Worm</td>
</tr>
<tr>
<td>Tumor</td>
</tr>
</tbody>
</table>

*all decimals rounded to the nearest hundredth *all percentages taken from a total #(n) of 21 unless specified *project duration measured in days **percentages taken from a total #(n) of 24, to account for 24 specific instances mentioned

Even though participants reported going to private clinics, it was typically only out of necessity for some problem that couldn’t be treated at the hospital or because they desired more immediate attention. A recent change in the Ecuador’s Ministerio De Salud Publica required appointments at the hospital to be made by phone. A few participants expressed that this made it easier for them, but there were many others who felt that the new policy prolonged the process. In some instances it was reported that participants
were scheduled for appointments two to four weeks later. In these cases, participants expressed that they would sometimes choose to go to a private clinic for the immediate attention offered there. However, a common deterrent for many was the high cost of the treatment and the medicine prescribed, which some described affecting their adherence to the treatment regimen.

If a community member needed to travel further for health related reasons, it usually began with a trip to a medical facility to Cariamanga. After it was determined that they required a treatment or specialist that the medical facilities in Cariamanga couldn’t provide, they would then make a separate trip back to Cariamanga to take a bus, if the individual was not directly transported by an ambulance. When participants reported travelling farther than Cariamanga for medical care, it was generally concerning more specialized treatments or surgeries that couldn’t be performed in Carimanga’s hospital. Further treatments were reported to be had in Loja, Quito, Guayaquil, and Catacocha.

Community member most commonly reported that they were only away from home for a day or less when they needed medical attention. This duration of project usually entailed traveling either to a health institution in Cariamanga or Chiriguara for less serious health concerns. Many participants would leave and return with the ranchera that same day. However, the reported range of time a participant could be away from home was between 1 day on the lowest end, and 90 days in the most extreme case. Some participants reported that, depending on their health concern, they would be asked to stay two or three days before returning home. In some cases participants expressed that they would be gone longer than one day due to transportation being unavailable for them to
return to their community. Those that were away longer typically cited that it was for more serious health concerns. A frequent example was surgery, and it required them to travel outside of Cariamanga. In these cases, participants could expect to be gone anywhere from eight to fifteen days. Part of this time was reported to be due to travel, while the other part was due to the time necessary for the treatment and recovery process.

Although participants were not asked for the reasons they would travel for health, some voluntarily revealed either past or present medical ailments for which they had sought treatment. In one case, a participant reported having the compounding ailments of Rheumatoid Arthritis, Gastritis, and Osteoarthritis. The conditions made it very hard for the participant to walk, and would occasionally lead to situations of full paralysis. In this case the participant has to make periodic trips to Loja to receive a treatment that the individual closely related to chemotherapy. Such a treatment weakens their immune system and makes them sensitive to the sun, so the whole process take about eight days for the participant recover. One of the medicines the participant used was reported to cost $2,500.00, although the insurance she has covers the cost.

Other participants reported having had their appendix out, while descriptions of joint or stomach pain were not uncommon. One participant’s son had been treated for tape worm. Another participant explained that they had been on the verge of losing sight in both of their eyes, and doctors had recommended that he have them removed. He was able regain sight in one eye by visiting a herbetero, or a person very knowledge in plant remedies, in city of El Tambo, which is some distance from Cariamanga and the communities. There was only one mention of diabetes among the participants who spoke
of medical issues. The participant explained that it was a recent diagnosis and that they had not been back to the doctor in six months because the medicine they had been prescribed was too expensive for the participant to afford. It would cost around $100 dollars to cover everything. Another woman explained that she had been in and out of the hospital quite frequently, had experienced many infections over the years, was anemic, and had recently given birth to a young child.

Two influencing factors which could not be easily quantified for display in the charts above were Emergency Situations, and what participants did In Case a Doctor was Unavailable. Responses varied greatly when it came to explaining what community members considered health emergencies. Concerns for health emergencies included; sever joint pain, headaches, high fever, vomiting, chills, sore throat, stomach pain, pregnancy complications, medication side effects, rashes, lacerations, dislocations, a child’s fall, blood tests and examinations, surgeries, and convulsions. When asked what participants would do in case of an emergency, many reported that they would either call for a truck from Cariamanga, or a neighbor with a vehicle to take them to the hospital. Only one participant reported that they would first call the ambulance, explaining that they avoided calling for a truck because of the cost. In some cases, either instead of going to a medical facility in Cariamanga or right before, participants reported that they would self-medicate with medication they already had or use herbal and natural remedies. A few participants reported that they would call their doctor first and ask them for instructions if something was wrong. In a case where children were mentioned, the participant said they
would take them straight to the emergency room, and if that it was something serious
they would not wait and call a neighbor with a pick-up truck.

As a complimenting question, participants were asked what steps they would take
in case a doctor was unavailable to them. While the question was intended to be separate
from previous questions concerning health emergencies, many participants seemed to be
confused by the question, perhaps because it seemed redundant. However, it did reveal
how participants would take care of what they considered to be manageable ailments, and
what they considered needed a doctor’s attention. As a result, the fourteenth influencing
factor category of *In case a Doctor was Unavailable*, was created. Similarly to the
*Emergency Situations* category, many community members reported that they would first
use whatever medicine they had been previously prescribed or natural and herbal
remedies they had available.

Medicinal plants and natural remedies were generally used as a primary option to
either treat a condition before seeking a medical professional, or to avoid traveling for
one altogether. These were generally considered mild conditions, such as a headache,
stomachache, low fever, and minor cuts and bruises. If the condition was to continue or
worsen, participants would call for a truck from Cariamanga, or a neighbor to take them
to a medical facility. During the weekends, private clinics are closed and many doctors
are off duty for the hospital. While the emergency room was still open, the situation often
prompted many participants to make to decide whether they would wait for the next
available appointment with a doctor, or travel to Loja for medical attention.
Medical Practitioner Results

The medical practitioners interviewed, generally reported seeing residents from the community every week, varying in numbers between one to ten in a given week, but typically at least one patient a day. Due to the different specializations of the doctors, some saw more patients than others, some acting more as a filter to direct patients to specialized care rather than frequent general appointments. Patients were reported to often come with others, similar to what many community members reported. The medical practitioners expressed that in those cases, it tended to be elderly community members who needed assistance, or whole families who often came at the same time because of the way appointments had to be made through the call center,

Community member were generally seen for various chronic conditions and respiratory infections, as well as for parasites. Diabetes and hypertension were common chronic conditions mentioned, as well as gastritis, arthritis, and muscle pain, for elderly community members, while children were generally seen for respiratory infections, parasites and vitamin deficiencies. Specifically, ecoli and cysticercosis were particular concerns for children. Only one medical practitioner reported any mention of Chagas or treating Chagas disease, and those were in conjunction with the Ohio University Tropical Disease Institute.

Appointments with the hospital are made through the newly implemented call center. Patients must first call ahead and schedule an appointment. In the past, the hospital accepted visits without an appointment. However, the call center was implemented due to changes in the policies of Ecuador’s Ministerio De Salud Publica.
Should a community member show up without an appointment, they then have to make one and come back on the scheduled date. Those who have scheduled an appointment are seen at that given time, and anyone brought into the emergency room is admitted immediately. Patients are first seen by a general physician to determine if they are able to treat the conditions or need to be referred to a specialist. If the general physician can treat the issue, then they will. Should a community member require the care of a specialist, they are either referred to someone in the hospital, or to another medical facility. This is typically a hospital in Loja or Quito. If they are able to be seen by a specialist in Cariamanga, depending on their availability and what the health issue is, it may mean that a community member will need to make a separate trip for the consultation.

The hospital offers emergency services to the community members through there ambulance service known as ECU 911. The ambulance was theoretically supposed to be able to go anywhere, although it was frequently mentioned that it is often restricted by the poor road conditions, particularly in the winter with heavy rainfalls. In these cases, emergency medical teams would agree to meet the community members half way, if it was possible. There were also a few programs which were supposed to go out in to the communities to provide regular medical checks. These programs checked for anemia in children, provided vaccines, dentistry checks, as well as offering care for women who were pregnant. The initiatives were reportedly to be done every week to fifteen days. However, the medical practitioners explained that the hospital did not have enough staff to maintain that frequency, and it now only happens once or twice a year. One participant did note that the communities had asked for a medical sub center before. The request was
declined, although there was a sub center in Chiriguara that many community members often used.

Concerning the challenges that the medical practitioners believed the community members to encounter when they needed medical attention, unanimously, they all believed that the distance, roads, and transportation system were an issue. In many cases the roads conditions were a concern due to the erosion and landslide. This, in turn, made it hard for an ambulance to reach an individual and vice versa. The medical practitioners also reported that they saw several pickup truck accidents, and that dust in the summer and rain in the winter hampered visibility. One participant felt that the distance and road conditions isolated the communities, and made them rely on traditional medicine. Another expressed that there wasn’t enough public transportation available, and that he had been to Bellamaria before noting that there were many places only accessible on foot or with a horse.

The new call center was also felt to cause difficulty for community residents who arrived for medical treatment without an appointment. Previously, if they arrived early they would go ahead and treat them. Now, they were told that they needed to make another appointment and come back. In particular, one practitioner said he used to see twenty-five patients a day, but now he only treats about seven patients per day. The sub centers around the communities were also cited as a challenge. Sub centers are small facilities outside of the hospital which provide basic medical care. Though they were available to community members, the sub centers did not employ permanent doctors and only operated Monday through Friday, between 8am and 5pm.
Access to healthcare is a problem prevalent in rural and poor environments worldwide in locations where geography and economics combine to deprive populations of preventative and illness related treatment. Growing recognition of the problem has led to articles and publications that discuss barriers to healthcare access in general or cite broad issues relating to regional, national, or international statistics. While important, the scope of these reports leaves overlooked the intricate and individual components that given populations must deal with in areas where serious diseases are prevalent. One such issue is the distance which individuals are required to travel for medical services. While it is a constantly recognized issue, particularly in rural areas, (Arcury et al, 2005) it receives little direct attention and full consideration. In relation to specific diseases, the attention to the distance required to travel for medical attention is even less, particularly for one which has been classified as a neglected disease. The disease in question, is Chagas disease.
NARRATIVE

The following narrative is meant to provide an illustration of the potential paths and project described in the results. This narrative is similar to the manner in which Hägerstarand illustrated the concepts of path, project, and diorama in his own work (Hägerstarand, 1982). His concept of diorama, or the entirety of an environment and landscape in which a project or, more often, multiple projects take place is important in understanding the full context of path and project. However, the scope of the entire diorama is too expansive to be comprehensively discussed in this writing. For the sake of simplicity, the narrative will provide a singular focus on the path the communities might undertake to compete the project of obtaining medical care and returning home. The following path described herein is an example of what community members might encounter in their efforts to obtain medical care. Although fictional, it is drawn from the responses of the community members and meant to represent a more typical situation, but not an extreme one.

A Hypothetical Path for Medical Care

A young family rises early on a Wednesday morning, around 4am, to prepare for their day. It is a Sunday, typically a market day for the family. The husband would usually go by himself to meet the ranchera around 5am to make a journey into the city to sell his crops as well as to gather supplies needed for the family. They try to limit their trips to once every week or every two weeks because of the cost and time the trip involves. However, they will not be doing so today. Their two children have been sick with fevers and headaches over the past two weeks. Compounding the situation, their
younger child seems to be having some respiratory problems. While the family had originally tried treating them with the medicine they had at home and some herbal remedies, their children’s condition did not improve. A week has passed since the original appointment was made with a doctor at the Cariamanga Hospital. It was the soonest they could be seen after calling to schedule an appointment.

Once the children are dressed and ready, as well as the young couple, they depart from their home on their way to the road. Their home is set back further away from the road, with only small trails connecting to it. Once they reach the road, they will still have about a half-hour walk to the point where they can meet the ranchera. It is still cold and dark in the early morning hours, but the family can still make out the signs of heavy erosion and wear on the roads. Many places have been washed away due to the winter rains, and small landslides have blocked parts of the road. They need to be careful as they walk together to avoid slipping on the loose dirt and gravel and possibly taking a fall.

As they walk, they meet other people from their community. Some were bringing their crops to sell at the market, while others were going to buy supplies. There are those who are unable to carry the loads or walk very well by themselves and must rely on a donkey to carry crops or as a transport for themselves. Those who are not heading to meet the ranchera are on their way to begin tending to their field in the early morning before the hot sun was overhead and beating down mercilessly on them. By the time they reach the school house where they meet the ranchera, they have only a short time to wait before it arrives. The ranchera has come from a community further down the road and is already partially filled with people from the earlier stop. They are a little anxious as they
hope there will be enough room for them. If not they will be forced to rely on an available neighbor with a truck or call for one to pick them up, either of which would be considerably more expensive. When the ranchera arrives, it is somewhat full, but, thankfully, there is enough room for the family. The adults are each charged $1.25 and, because the children are still young, the cost is only $0.50 for each one. However it will still be the same cost on the way back and, after only earning $40 from the previous months work, it will be a costly trip. Some individuals are turned away by the ranchera driver because they want to take their crops to sell, but there isn’t enough room for them. They would have been charged extra to bring their crops, but they are unhappy as they walk away.

The road on which the ranchera travels is better than those inside the communities, but they still suffer from many of the same issues. Often, along the way, the road narrows and there is only room for only one vehicle to pass. In some cases vehicles have collided, although rarely. More commonly, two vehicles meet and one must reverse until the road is wide enough for both to pass. It is an uneven and dusty ride in the summer months, but, thankfully, it is passable. In the winter when the heavy rains set in, the communities are sometimes cut off completely as roads become impassable due to the amount of flowing water. The whole ride usually lasts a bit over an hour, but due to the ruts in the road, it is perhaps a little longer today. Still, the ranchera picks up passengers along the way and stops at the next community along the road before continuing.

The ranchera drops the family and the rest of the passengers off in the town square of Cariamanga. It is up to them to be back when the ranchera departs at around
3pm. If they miss the departure, they will either be forced to stay or have a truck take them back. The family makes the short walk down the hospital near the entrance to the city. Once there, they wait for their scheduled appointment time. Since the whole family has come, they will all receive checkups while they are there, not just the children. The family is first seen by a general physician, who will evaluate each person’s needs to determine whether they can provide adequate treatment. If not, they are referred to a specialist, which may require a separate appointment and another trip to Cariamanga.

Today, the two adults receive regular checkups and are seen for general aches and pains that many community members experience from their work. Thankfully, they are being seen for nothing serious, but they know that some of their neighbors in the communities are being treated for diabetes, hypertension, arthritis, and other more serious ailments. One of their children is determined to have the flu and is prescribed some medicine which they can obtain at the pharmacy. However their younger child seems to need more extensive evaluation. The doctor has a nurse draw some blood and he tells that the family that it will be a few days until the results come back. The young couple must then decide whether to go back home and return or to stay in Cariamanga for those days. They make the decision to go home and return once the results have come in. They hurry to meet the ranchera that afternoon to return home.

In the following days, the family will make the same trip back to Caraimanga. However, only the mother and the younger child will return this time to save cost. This will also allow the other child may go back to school and the husband can attend to their crops and livestock. When they arrive back in Cariamanga at the hospital, the doctor
explains that the child most likely has cysticercosis, or a tapeworm infection, and will refer them to a private clinic where it can be treated. Unlike the hospital, not all of the charges from private clinic will be covered by the family’s insurance. However, if the tape worm is left, it could potentially cause brain damage.

The mother then leaves the hospital to make an appointment with the private clinic where they were referred. Although it is more expensive, given the circumstances, they have no choice. The appointment is made for two days later, and the mother and her child must once again return home with the ranchera, only to come back in a couple of days. In transportation cost alone, she and her family have spent $9.50, and it will cost them at least another $3.50 for the mother and the child to go again for medical care, assuming that it it’s the last visit. This is not factoring in the cost of the treatment they may incur. It is also one more day she is away from home. It is a lost day that she could have spent helping with the crops and the fields, as well as taking care of her other child. However, it must be done because it is the only way, aside from traveling even further to Loja or Quito, to receive treatment.

When the next two days have past, the mother once again wakes up early in the morning, and gets her child ready to make the trip down to the road and then to the school house to meet the ranchera. Again, they have been lucky not to encounter a full ranchera, and make the ride back to Cariamanga to receive treatment from the private clinic. This time however, it takes them nearly an hour and a forty five minutes to reach the city. At one point the ranchera meets a larger truck at a place in the road where it is too narrow to allow them to pass, and it takes some extra time for them to locate a place
to pass each other. The ranchera was also stopping frequently to pick others up along the roadside, making it a longer than usual trip. Finally, they reach the town square, and the mother takes her child to the private clinic for their appointment.

It would then take them several more visits to make sure the parasite was gone after the initial treatment. It had cost them nearly 20 dollars in travel expenses, not to mention the cost of the treatment, and several days away from home. During this time the mother was unable to help with their crops and livestock, and the child was unable to attend school on the days they were travelling. In total, they made five trips to Cariamanga, four more than they usually would have in a given fifteen-day period. Overall, the mother and her child had spent nearly two weeks seeking treatment before finally being able to return home without further visits.

A Hypothetical Path for Emergency Medical Care

An elderly couple, who live some distance from the road, find themselves faced with a health emergency during the mid-week. They are both older, in their sixties, and are retired, receiving income from the government or, Bono. The two live together by themselves, in their three-room adobe home. They no longer raise livestock due to the labor and cost of their upkeep. However, they still keep a few chickens, a dog for security, and a donkey to assist them with transporting supplies. The woman had lived in the community all of her life, and her husband moved there with his family when they were young. The house they lived in is the same one her family lived in before her, although over the years they have made several renovations, replacing the roofing and
adobe where it had crumbled, as well as adding an additional room when they began to have children.

All of their children have now grown up and moved away due to marriage or to obtain jobs. Occasionally, they send a little bit of money back to their parents. Although her husband used to work in agriculture and prides himself for having never gone to the hospital, he has been feeling ill during the past few days. Feeling worse this morning, he has been vomiting, and complaining of a sharp pain in his abdomen over the past few hours. They have tried treating it with the medication they have, as well as a few herbal teas. However, the pain has not been subsiding, and the husband believes that it is getting worse quickly. Before this morning, he had been feeling that it was just something that would pass, and he would feel better. Then he began to experience trouble standing and is feeling nauseous when he walks.

The day before he had intended to go to Cariamanga to get supplies and some food for their home, but didn’t feel that he could make it even with the assistance of the donkey and spent the day resting. After speaking about it, they decided it was something more serious which needed immediate treatment. It is already early afternoon and the ranchera has been gone for hours.

Since they feel that this cannot wait until the next morning, the wife calls Cariamanga for a truck to come and pick them up. Although it is more expensive, they cannot afford to wait, and their neighbors, who have a truck, have gone out for the day. Because of the distance, it takes the truck close to an hour and fifteen minutes to reach the entrance to the community. The driver cannot not drive directly to their home because
the roads have been partially washed away from heavy winter rains. He can only get part of the way, so he leaves his truck about a half-mile away from the couple’s home and walks the rest of the way to assist the couple.

The husband’s pain and difficulty walking slows the group down quite a bit, and it takes them close to a half-hour to reach the truck. By the time they are ready to leave, the driver is aware that even if he hurries, it will take at least an hour or more before they can get the husband to the hospital. The heat and the dust kicked up along the narrow and winding roads only made the husband feel worse as he lies in the back of the truck’s cabin. Doing his best to drive quickly and avoid as many of the ruts and bumps as possible, the driver finally arrives at the hospital. Once there, the elderly man is quickly admitted to the emergency room.

After a brief examination and some blood work, the doctors recognize that the elderly husband has an appendicitis. Unfortunately, the hospital’s surgery room was closed for renovations, and the husband is unable to be treated there. The medical staff quickly decide to transfer him to the hospital in Loja, and load the husband and his wife into an ambulance. However, it requires another two-hour drive by ambulance before they reach the second hospital. The ambulance driver does his best to get them there as quickly as possible. However, some parts of the road require driving with caution until the driver reaches the section of the road which is paved.

Once the ambulance reaches Loja, the husband is quickly taken into the emergency room and quickly scheduled for an immediate surgery. After the procedure is completed, the couple needs to remain in Loja for several days so that the husband has
some recovery time. This allows the doctors to re-check him each day and make sure that there is no infection or complications. While the husband is able to stay in a hospital bed, his wife has to find lodging for the time they were there. It creates an additional, but unavoidable cost.

After her husband is discharged, they have to begin their journey home with a bus ride from Loja back to Cariamanga, where they must transfer to the ranchera or pay for a truck back to their community. In addition to the $20.00 that the initial truck ride has cost them, the tickets for the return trip on the bus cost $4.00 per person. The return bus ride takes the couple another two and one-half hours to reach Cariamanga. Luckily, it is early enough in the day that they are able to wait in Cariamanga until the ranchera departs in the afternoon. They are thankful that this saves them the cost of another truck ride.

The ranchera drops them off at the entrance to their community late that afternoon. The elderly couple still has to walk nearly an hour back to their home, and the walk is slower because the husband is still walking slowly and remains sore following the surgery. However, they cannot afford to take too much time to rest because it will soon be dark, and there will be little light remaining to navigate their way back to their house. It also means that the roads, which are already in poor condition, become even more difficult in the dark. Thankfully, a neighbor along the way offers them assistance with his donkey, allowing the husband to ride and removing the burden of walking, so that they are able to complete their journey more quickly. In all, the couple has spent nearly eight days away from home, while the husband was being treated. However, they are grateful
that he was able to reach the hospital and obtain treatment before his appendicitis worsened, as they realize that he might have died.
DISCUSSION

Effects of Distance: Cost, Resources, and Implications

Based on the results and the narrative, it is apparent that distance does affect the communities’ access to health. Similar to some of the conclusions reached by Arcury et al., Cassell et al., Kadobera et al., Lankila et al., McGrail et al., and Ziklinski et al., it is not necessarily the raw distance which presents a concern, but the manifestations of traversing that distance. Access to healthcare is hampered in four main aspects. 1) the cost of travel, 2) the availability of transportation, 3) time, and 4) physical road conditions. This is not to say the raw distance is not impactful on the health of the community, but it must be evaluated beyond raw mileage. These issues compound on one another, and severely limit the frequency with which community member travel for normal medical care. Many community members will travel for healthcare only if it is absolutely necessary. This reluctance extends to both normal primary care and emergency care. Regular health checkups are not common, and, generally, are only done if an individual or family is at the hospital or clinic for another reason.

The cost of traveling may seem low to many readers. However, it is important to keep in mind that the average estimated monthly income may be $40.00 for a family, and a one way cost of $1.00 to $25.00 is incredibly high in relative terms. This is further compounded by the cost of the medical treatment. It is true that many resident have some form of medical insurance such as, Seguro Campesino. This insurance will cover the public medical cost. If treatment from a specialist is required, individuals are forced to rely on a private clinic or travel further. In the private clinics, insurance does not cover all
treatment cost, so a family or individual could incur significant medical costs. The cost of travel to Loja or Quito from the communities must be added to this out-of-pocket expense. Since traveling further often requires a bus ride rather than simply the ranchera cost, a community member could expect to incur an additional cost in the form of a bus ticket.

From the perspective of income, the ability to cover travel costs is significantly impacted by the distance from the communities to Cariamanga. Many community members rely on agricultural work and raising livestock as their sole methods of income. Cariamanga represents the nearest market where they can sell their goods. However, since the ranchera does not allow for community members to take large loads with them, community members are forced to use the more expensive option of a truck to transport their goods. Whether it is a Cariamanga cooperative truck or, even, the truck of a neighbor, the transportation cost still greatly impacts the profits they are able to make selling their goods. This means that, overall, they have less money for food, personal needs, travel, and to pay for more serious medical care. It was not unusual for participants to report that they had not been back to the doctor or refilled their medications because of the cost, with one participant reporting that it would take $100.00 to cover everything.

Availability of transportation coincides closely with the cost of transportation. At the time of this study, there was only one ranchera operating daily for all three communities. According to reports from the participants, this represented an improvement. In the past the ranchera had not run reliably every day. However, community members are dependent on the ranchera. If a participant wants to use the most
cost effective mode of transportation, they must utilize the ranchera. This means that the community member must rise very early in the morning, particularly those who are far from the meeting points of the main road, and walk or ride a donkey (for those who have difficulty) to meet the ranchera. Should they miss it or if it is already at capacity, the community member will have to call for a truck or request and pay for a ride from a neighbor who is willing to give them a ride. However, even a neighbor is not always an option, considering that very few community members have an available truck. Compounding this issue is the potential for a law violation for the individual with a truck. There is the risk of a fine if the owner/driver of the truck is caught transporting someone, since this is currently against the law.

Even if a community member is able to get a ride to Cariamanga, return transportation is not always available. If a community member is not there when the ranchera departs, then they must choose whether to remain in the city overnight or call for a truck to take them home. Weather is also an important factor which influences the availability of transportation. Drivers are unable to make lengthy drives in heavy rains, particularly if flowing water is covering the roads. This can often completely isolate the community member, and any health needs, immediate or not, have to wait until the rain clears. Although ambulances are available to the community members, they are only called for in serious emergencies. In particular, the community member will try and search for an available form transportation in the communities first. Given the amount of time it would take an ambulance to reach the specific community and then return to the hospital, it is faster for community members to leave from their community immediately.
For health care needs requiring residents to travel farther than Cariamanga, there are busses which have scheduled departures and arrivals in the city regularly. However, intercommunity and community to Cariamanga travel are more complicated and variable in availability.

Upon initial consideration, it would seem that the amount of time people in the communities spend traveling for health care and receiving it is only a limited burden. Most participants reported that it took then less than one day to travel, receive, and return home from medical care, unless it was something more serious. However, an entire day in which community members are required to leave early in the morning and return late in the evening is more critical to individuals who live in a rural area and work primarily in agriculture. Any time spent away from home is lost time for tending their fields, harvesting, or completing tasks around and in their homes. Because of the amount of time it takes, medical attention cannot be sought and obtained quickly, especially when the process usually begins with a phone call to schedule an appointment eight to fifteen days later. When the health concern is more serious, this consumption of time is amplified by anywhere from a few days to weeks and months.

Time is also a serious concern for emergency situations. While many community members try to treat as much as they can themselves with herbal and traditional remedies and any medications they have, there is a limitation as to how much they can treat themselves. Whether it’s traveling to the hospital or a private clinic, the raw amount of time and the distance is an issue. Unfortunately, the quickest an ambulance or truck from Cariamanga can reach the patient and bring them back to the hospital is at least double
the one way travel time. In a critical emergency this could lead to serious complications
or death. Those who have their own form of transportation are able to take themselves or
offer immediate assistance to a neighbor. However, few community members have a
vehicle capable of transporting more than one person. The ranchera is only an option if
they wait until the following morning.

Road conditions both inside and outside the communities also greatly affect the
communities access to health. Although long, winding, and narrow at some points, the
main road connecting the communities to Cariamanga is better maintained than local
roads inside the communities. However, even these main external roads suffer from
serious design and maintenance issues. Due to the easily eroded terrain and fluctuating
vertical elevation, any road improvement projects would be a major, costly, and
dangerous undertaking. In view of the length of the road, the time needed for an
improvement project could take several months or longer. This would leave a very short
window for construction due to the winter rains, and incomplete work could result in a
loss of progress and even more severe erosion in some locations.

The equipment and personnel required for a road improvement project would also
prove to be costly for the county. The heavy machinery required would potentially
hamper and disrupt the flow of any traffic on the road. Because of the many narrow
sections and blind turns, an influx of large vehicles would require careful planning of
construction times when traffic was least due to the increased difficulties of having
vehicles passing one another, as well as backups in the traffic flow. Even if substantial
improvements to the road were able to be made they might well prove to be difficult to
maintain. Without more effective drainage and road bed construction, the main road would likely continue to be subject to continuing erosion and weather limitations as previously experienced with an unending demand for upkeep and repair. Main road improvements might also require the closure of the road for some portion of the construction, cutting off the most direct and time efficient route to the communities and increasing the hardships during the duration of the closure.

As they depart from the main road, roads appear adequate, although the further they extend toward the communities, the greater the signs of erosion and ruts. The farther into the communities one goes, the more markedly degraded the roads become. In some cases, entire sections of road are gone, and no vehicle is able to continue. Many of the homes are not connected by roads, leaving small trails as the only access to them. Many community member have asked for the roads to be repaired or extended to their homes. However the county has been unable to fulfill these request, despite previous plans to do so, due to an unwillingness of the local contractors to work in the communities.

These conditions present problems not only for community members, but emergency medical teams as well. Sometimes, the ambulances were unable to reach every point in the communities. In such cases, emergency responders had to ask patients to meet them half-way, or they have to improvise creative methods with the help of other community members to reach the patient. In the winter when rains are heavy, even the ambulance cannot reach the communities. The road conditions also mean that even emergency services cannot rush because of the dangerous turns and narrow stretches. They have to travel at a reasonable speed or risk causing an accident.
Chagas Disease

Although this research could not directly measure the prevalence and economic costs of Chagas disease in the communities studied, these findings do have significant implications for those living in rural communities burdened by the disease. As noted in the literature on neglected tropical diseases, in which Chagas disease figures prominently, illness, disability, and reduced life are the direct results of the disease (Conteh, Engels, & Molyneux, 2010). The more indirect results include reduced productivity and income and increased spending on medical care and travel to receive it. Congruent with the socioeconomic costs cited above, the current findings produced a picture of poor communities struggling with the effects of limited access to healthcare.

While a majority of the communities were aware of the disease thanks to the efforts of Ohio University’s Tropical Disease Institute and the Healthy Living Initiative, the infrequency with which community members get regular checkups results in fewer conversations and screenings for the disease. This lack of immediacy in medical care, particularly as it relates to the acute symptoms of Chagas disease, present themselves as mild conditions, which can mimic non-serious bites and stings. Thus, the early Chagas manifestations may be, and often are, easily treated or passed over, with or without awareness that an individual is infected. However, treatment of the chronic symptoms are the most severely impaired by the spectrum of issues that impact traversing distance for medical care. Lopez-Cevallos and Chi (2009) note that nearly one-third of Ecuador’s population similarly lack access to healthcare creating inequities and further the plight of already socioeconomically impoverished areas.
Many of the chronic symptoms of Chagas disease, particularly the mega formations, require surgery to be treated (Silva, 1999). Chronic heart disease is treated through a number of possible avenues including drug therapy, heart transplant, and several other treatment strategies (Munoz-Saravia, Haberland, Wllukart, & Schimke, 2010). These serious Chagas conditions and their treatment require consistent medical access and health care checkups to be successfully controlled. If not, the symptoms can become fatal. Identifying and treating Chagas disease before these advanced stages are crucial, as it can be treated and successfully cured in the acute stage without further treatment or invasive surgery. However, this requires recognition and consistent health care.

Many studies have also examined socioeconomic aspects of Chagas and other neglected tropical diseases (Grijalva, 2015; Lannes-Vieira et al, 2010; Coneht et al, 2010) on a national and community level. Distance impacts not only a community’s access to health care, but their ability for economic opportunity is another one those aspects. Infrequent regular visitation to health services of any kind and limited access to economic opportunities greatly impact residents of the communities’ ability to stay healthy and to generate income to raise their socio economic status. Further income would allow residents to travel more easily, increase their standard of living, and afford health services and medicine that are more easily and readily accessed.
CONCLUSION

Distance does affect the communities of Bellamaria, Chaquizca, and Guara’s access to health in an adverse way. This impact occurs across the amalgam of distance defined as including cost, time, availability of transportation, and physical road conditions considered in the context of existing disease issues in the area. Interviews with individuals from all three communities combined with observations of the physical conditions of the roads, the bus and ranchera schedules, as well as interviews with the health care professionals of the area all combined to produce a consistent picture of the difficulties encountered by the people of the communities in their efforts to access healthcare. A resident’s ability to traverse, afford, and sacrifice time for regular, as well as specialized medical care, was limited by the distance and time it take to reach the nearest medical facilities. Residents of the communities only seek medical services when it is absolutely necessary or strongly concerns their children. If at all possible, they will try to treat and handle illness themselves before making the decision to go into Cariamanga.

This study also explored the implications, costs, and resources necessary for residents from the three communities involved to travel to Cariamanga for health services. It became clear that time and energy are essential for those who travel to Cariamanga for healthcare. Not only must citizens rise early and often make their way across pathways from their homes to stops for the ranchera, but they must plan for a full day away from their homes and responsibilities. The costs of travel for medical care, while not high by some standards, could become a significant burden for community
residents. Although the ranchera, the public bus system provided for residents at lower costs, was available on a daily basis, using it often and including all family members constituted a burden on many local families. Additionally, if the ranchera was at capacity or was missed, citizens had to use more expensive forms of private transportation. Other costs associated with seeking healthcare were the loss of a full day of working on one’s homestead or for wages.

The findings from this project also have implications for how Chagas and other diseases in the communities are impacted by traveling to Cariamanga for healthcare. While residents of the communities are aware of Chagas disease, it’s initial and easy treatable symptoms are often misunderstood and ignored. Later, its long period of latency with no symptoms followed by a wide variety of organ problems that mimic other conditions make it difficult to treat in the latter stages. Further, stigma remains attached to Chagas, so that when its serious symptoms appear, the social and economic cost of seeking treatment may lead to the high level of healthcare that becomes necessary. In addition to Chagas, diabetes, hypertension and other diseases in the communities may go untreated due to time and cost, particularly where private, specialized care is necessary. Finally, preventative care is often neglected due to the difficulties and costs cited in this paper in traveling to Cariamanga. In any community bearing the burden of disease and illness in its population, the human and economic costs are high. Both the ability to produce and consume are diminished, and the ingredients for growth of a population are limited.
In view of the information gathered in this research, some recommendations that would benefit the citizens of the three communities are offered. At a minimum, residents could benefit from increased public transportation options. An additional ranchera that could make a second run later in the day and then return before or around the same time as the other ranchera would provide a second more affordable option for residents and allow for a more flexible travel schedule. It would also double the amount of people who were able to travel by ranchera in a single day, meaning community residents could more easily rely on the option of a ranchera.

However, only increasing public transportation has a limitation on the overall effectiveness of increasing their access to health. While more residents would be able to travel more frequently for health when needed, it is unclear whether this change would increase the overall frequency with which they went. The cost would still be the same, and their income would remain the same as well. As the primary form of income is dominated by agriculture and livestock, their only method of transporting crops and supplies are through cooperative trucks, or a neighbor’s truck. These options are considerably more expensive and greatly reduce the overall income that citizens are able to make selling their goods at the market. With expense being a major consideration for many, increasing public transportation would only allow for increased accessibility, but it still be limited by weather and road conditions.

Enabling community members to save more of their income would lessen the burden of unexpected medical cost. These cost could include medicine from the pharmacy or utilizing other medical facilities, such as the private clinics. It also means
that residents could potentially increase their overall economic status and further improve their living conditions. In some cases, home improvements in the communities are left unfinished for periods of time because residents are unable to afford to complete the process (Neito-Sanchez, Baus, Guerrero, Grijalva, 2015). This further exposes them and their families to the elements, insects and other environmental conditions, until the family has saved enough money to complete the construction.

A more ideal situation for the communities would be to have a sub center build nearby, providing community members with accessible healthcare and medication, as well as greatly reducing the travel time and cost for community members. During the course of interviews conducted in the course of this study, many community members expressed a desire for such a nearby sub center. Other research suggests that such sub centers built in proximity to the communities have been show to greatly reduce travel cost in other provinces (Gaus et al, 2011). Having close and available healthcare would allow for routine care and checkups so that residents would not have to travel to Cariamanga for basic primary care. Those who live further from the road would also experience a greatly reduced amount of travel time, as walking from one community to the other is not uncommon. While more specialized care would still require community residents to travel to Cariamanga and perhaps further, a rural sub center within the communities would also be expected to help residents better treat and control their health conditions. Reducing the incidence of Chagas and other diseases through improved access to healthcare increases the overall health and productivity of the communities.
This project evaluated the impact of a distance and its defined concomitants of cost, time, effort, and availability of transportation in the three communities under consideration in Southern Ecuador. While the findings of an adverse impact of distance on the accessibility of healthcare of the three communities studied is documented, generalizations to other communities must be limited. To the extent that physical terrain, disease states, transportation availability, and socioeconomic factors are similar, it is likely that barriers to healthcare access would occur. Concomitant costs of distance should be investigated in future research in order to better understand the role of these factors in healthcare access. Disease states and illnesses endemic in any area will diminish the health, vitality, and productivity of its citizens. It is hoped that additional research in this area can be conducted to identify factors that contribute to community health issues and/or suggest methods to increase healthcare accessibility.


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