8-2018

Survey Assessment of Community Knowledge and Prevention of Chagas Disease and Its Vector in Hidalgo and Cameron Counties

Adam Dennis Wiejaczka
The University of Texas Rio Grande Valley

SURVEY ASSESSMENT OF COMMUNITY KNOWLEDGE AND PREVENTION OF CHAGAS DISEASE AND ITS VECTOR IN HIDALGO AND CAMERON COUNTIES

A Thesis

by

ADAM DENNIS WIEJACZKA

Submitted to the Graduate College of
The University of Texas Rio Grande Valley
In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2018

Major Subject: Biology

SURVEY ASSESSMENT OF COMMUNITY KNOWLEDGE AND PREVENTION OF CHAGAS DISEASE AND ITS VECTOR IN HIDALGO AND CAMERON COUNTIES

A Thesis
by
ADAM DENNIS WIEJACZKA

COMMITTEE MEMBERS

Dr. Teresa Feria-Arroyo
Chair of Committee

Dr. Megan Keniry
Committee Member

Dr. Tamer Oraby
Committee Member

August 2018

ABSTRACT

Wiejaczka, Adam Dennis, Survey Assessment of Community Knowledge and Prevention of Chagas Disease and Its Vector in Hidalgo and Cameron Counties. Master of Science (MS), August, 2018, 39 pp., 2 tables, 11 figures, references, 51 titles.

Chagas disease, caused by the parasite *Trypanosoma cruzi*, kills thousands of people annually and is the dominant cause of infectious myocarditis worldwide. Kissing bugs are vectors that carry *T. cruzi*. and are found in the Lower Rio Grande Valley (LRGV). There is no vaccination nor cure for Chagas. The best mechanism of prevention is to control vector infestations. Little research is available regarding the level of understanding local communities have about Chagas.

Our goal was to test the knowledge of several communities in the LRGV on Chagas disease. Our hypothesis states that local communities do not have sufficient knowledge and resources concerning Chagas. Surveys were administered throughout the LRGV from January to June and were analyzed. Results confirmed 85% of participants had no knowledge of the disease; moreover, participants that had knowledge were college educated. Educational programs regarding prevention are key to reducing the transmission and spread of Chagas.

ACKNOWLEDGMENTS

I would like to thank Dr. Teresa Feria-Arroyo for her guidance and mentorship throughout my undergraduate and graduate studies. She has been most supportive since the start and has always encouraged me to pursue greater heights. I would like to thank my committee members, Dr. Megan Keniry, Dr. Christopher Vitek, and Dr. Tamer Oraby for their continued efforts, advice, and revisions on my work. Their help has warranted a sound and just thesis. I would also like to thank Dr. Zaidan, Dr. Lowe, and Dr. Dearth for assisting in the process of certification and completion of my thesis.

I would like to acknowledge and thank UTRGV College of Sciences for the Dean's Graduate Research Award for Summer 17'. We would like to thank LUPE, HOPE, Valley Care Clinic, and Renaissance Mobile Clinic for allowing us to collaborate with community members at their facilities. We also appreciate the City of Edinburg Endowment Center, City of Alton Recreation Center, City of Peñitas Proyecto Desarrollo Humano, and City of San Carlos for allowing us to present our surveys and educational material to the community. Lastly, I would like to thank all the participants that helped with this research.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER I

INTRODUCTION

The Disease

Chagas disease is considered one the most severe parasitic infections of the American continents induced by the protozoan *Trypanosoma cruzi* (*T. cruzi*); moreover, it is the most important vector-borne disease in Mexico, with 89% of the population at direct risk (WHO, 2008; Carmona-Castro et al., 2018). Chagas disease is among the leading neglected tropical diseases (NTD's) worldwide and carries a substantial burden in the Americas' (Hidron et al., 2010; Hotez et al., 2016). It is also the dominant cause of infectious myocarditis worldwide, in which cardiac involvement is present in 90% of all cases (Dilma Do Socorro Moraes De Souza et al., 2016). An estimated 8-10 million people are currently infected with Chagas worldwide (Schmunis and Yadon, 2010), with almost 7.7 million of people infected residing predominantly in the Latin Americas (OPS, 2006). An increasing number of people are also acquiring infection in the United States and Canada (estimated at 300,000) where the disease was previously not found to be endemic (Gascon et al., 2010). Chagas disease is currently responsible for 12,500 deaths annually worldwide, down from the 21,000 reported in 2000 but still of major concern for countries endemic to the disease (Rassi et al., 2000; Moncayo, 2003; WHO, 2015). It is a chronic zoonosis (naturally infectious diseases that can be transmitted from insects to humans) and has alarming geographic coverage including South, Central, and North America, as well as parts of Europe (Perez et al., 2015). Majority of infections are vector-borne but can also be transmitted

through blood transfusion, organ transplantation, vertically (from mother to infant), and a few uncommon cases by ingestion of food or liquid contaminated with the *T. cruzi* parasite (Hidron et al., 2010). Once infected with the parasite, 40% of hosts will ultimately display cardiac and/or digestive conditions which could occur up to 30 years after the initial transmission event (Laranja et al., 1956; Perez-Molina and Perez, 2018). Currently there is no vaccine, cure, or immunoprophylaxis (active or passive immunity) available for Chagas disease; furthermore, drugs that are used to battle the infection are not readily available to most and are not FDA approved (Dias et al.,2008). Chagas disease is believed to predominately affect the poor communities (colonias) and people of lower socioeconomic status much in part because of the biomedical and psychosocial barriers that hinder diagnosis, treatment, and control (WHO, 2015). People of this status are more at risk because they do not have access to healthcare and have limited availability to resources, have subpar living conditions (i.e. no air conditioning, no screened windows, cracks in walls and ceilings), have domestic and/or sylvatic animals in proximate location to living spaces, and have unkempt/overgrown yards and canals in their colonias (Briceño-León and Galván, 2007). Chagas disease has been labeled a proxy for poverty and disadvantage by the WHO in which it affects populations with low visibility and little political voice (WHO, 2010). The stigma and discrimination associated with Chagas disease often prevents prompt detection and control because patients prefer not to know about the condition (Ventura-Garcia et al., 2013). Globalization and immigration are considered the main factors in the increasing importance among non-endemic countries; specifically concerning transmission by vector and transfusion in North American and parts of Europe (Benjamin et al., 2012).

The Vector

The kissing bug, triatomine bug, assassin bug, vampire bug, or reduviid is responsible for the transmission of Chagas disease and is the dominant vector in the transmission of the parasite. In the Latin Americas', kissing bugs are known as chinches, benchuca, barbeiros, or vinchucas. The kissing bug gets its name from biting a host most often around their facial region due to the presence of carbon dioxide exhaled by the host. The kissing bug is a nocturnal insect that feeds on the blood of its prey (hematophage) and typically lives in the nests, burrows, yards, or houses of their prey (Schofield et al., 1987; Wormington et al., 2018). The complete life cycle of the insect can range anywhere between 4-24 months depending on ecological conditions and is divided into two distinctive stages: the immature nymph stage; and the adult winged stage (Schofield et al., 1987). The kissing bug gets the *T. cruzi* parasite by ingesting blood from an infected animal or human; moreover, the cycle is completed when infection from the host occurs (Magill and Reed, 2000). The *T. cruzi* parasite is then typically transmitted when contaminated feces or urine from the kissing bug enter the bite wound, mucous membranes, or breaks in the skin of the prey (Bern et al., 2011). The feces or urine of the kissing bug can contain metacyclic trypomastigotes (flagellated) that can enter and move through the bloodstream and eventually infect multiple organ systems (i.e. cardiac and digestive) (Bern et al., 2011). *Triatoma infestans* is the most important vector in Latin America because it feeds on the blood of mostly domestic populations; however, *Rhodnius prolixus* is the second most important vector in Latin America primarily because it feeds on both domestic and sylvatic populations indistinctively, in turn assisting to the spread of the disease and creating blood reservoirs infected with *T. cruzi*.

The most common symptom of a kissing bug bite is an allergic reaction called romaña, which induces swelling around the site of infection, and a fever that diminishes 4 to 8 weeks after initial infection; however, most bit by a kissing bug will be asymptomatic (Klotz et al., 2010). Although there have only been few reported cases of vector transmission to humans in the US, more than 20 wildlife species currently carry the *T. cruzi* parasite. The low number of human cases reported may stem from the high number of those infected never developing clinically relevant diseases, roughly 60 to 70% of those infected (Hidron et al., 2010).

Kissing bugs belong to the family Reduviidae and sub-family Triatominae and are comprised of various species and subspecies (Garza et al., 2014). There are 141 species of kissing bugs worldwide that can transmit Chagas disease, with majority residing in the Latin Americas' (Galvão et al., 2003). Out of the 141 species found worldwide, 40 species and subspecies of kissing bugs can be found in North America (Mexico, US, and Canada); furthermore, 12 of those species can be found in the US, and 4 of them exclusively in the US (Ibarra-Cerdena et al., 2009). Out of the 12 species of kissing bugs found in the US, 7 can be found in Texas which include: *Triatoma gerstaeckeri*, *T. indictiva*, *T. leticularia*, *T. neotomae*, *T. protracta*, *T. rubida*, and *T. sanguisuga* (Bern at al., 2011).

The Parasite

T. cruzi is a flagellated, intracellular protozoan that has two distinctive phases in its life cycle: flagellated trypomastigote form; and non-flagellated amastigote form. Once the initial infection of an individual originates, an acute syndrome (acute phase) characterized by flagellated trypomastigotes of *T. cruzi* circulate in the blood stream extracellularly for 4 to 8 weeks; this allows the infection of various organ systems in mammals (specifically vertebrates) over a short timeframe (Hidron et al., 2010). In the absence of specific treatment during the acute

phase, there is a 2 to 8% mortality rate, particularly among children (Coura and Castro, 2002). Individuals that are infected with Chagas disease and are in the acute phase of the disease can either be asymptomatic or present mild to severe forms of complications involving cardiac and/or digestive conditions; however, this disease is lifelong regardless of the appearance of symptoms (Vasconcelos et al., 2015). It is stated that the mechanisms pertaining to the development of the more severe form of Chagas is notably unknown, however, recent evidence is surfacing correlating the human immune response (i.e. cytokines) to the diversity of forms the Chagas disease exhibits. Chagas disease is unique in such a way that it evolves and divides intracellularly inside the host; beginning with an asymptomatic acute phase which is prominently characterized by circulating antibodies against *T. cruzi*, ECG readings that represent surprisingly ordinary function, and normal radiological analyses of the body (Vicco et al., 2014). The asymptomatic period of Chagas disease (chronic phase) can last for 10-30 years, showing no signs of infection which may deceive preliminary diagnoses; however, in children, this phase may be reduced (Viotti et al., 2004). Furthermore, the disease ultimately develops into Chronic Chagas heart disease (CCHD) for about 30-40% of people infected, which is roughly 50,000 annually (Vicco et al., 2013). An additional problem lies in the body's ability to control the infection; at first there is substantial suppression of *T. cruzi* among CD8+ T cells, however, only partially effective, they fail to completely clear all the *T. cruzi* infection which demonstrates the success of the disease evading host immune responses (Tarleton, 2015).

Shortly after the initial infection (roughly 4 to 8 weeks), *T. cruzi* favors the amastigote form for the remainder of incubation; allowing the parasite to replicate in the cytoplasm of the CD8+ T cells, cardiac cells, and/or cells of the digestive tract. Recognition of the infected cells plays a crucial role in the humoral response of the host; unintentional deletion or inhibition of the

CD+8 T cells ultimately resulted in uncontrollable parasite load and chronic infection of hosts (Tarleton, 2007). Once the cell has reached the maximum parasite load, the cell is lysed and trypomastigotes invade adjacent tissues and/or spread throughout the body via bloodstream or lymphatic system (Hidron et al., 2010). Recent data suggests that the host can only partially clear the parasite from the body; which demonstrates chronic infection was due to the evasive maneuvers of *T. cruzi* from humoral response, and not only from the suppressed immune system of the individual. The response time for infected CD8+ T cells is relatively slow, which allows time for gene expression to occur (T cell response about 8-9 days) (Tarleton, 2007). However, in this timeframe, *T. cruzi* has already completed multiple rounds of replication and has exited from the host cell (4-5 days). *T. cruzi* has also produced hundreds of newly converted trypomastigotes that have now traveled through the bloodstream and lymphatic system in search of additional CD8+ T cells/organ systems to invade. The first onset of host cell death and parasite release correlates to the initiation of the immune response/detection of the infection; this suggests that the stimulus for activation of the CD8+ T cells was not the initial infection of the parasite, but four to five days after initial infection. The lead that *T. cruzi* has on the immune response plays an important role on the longevity of the disease in the host; contributing to a life-long infection on account of delayed trigger response mechanisms.

The *T. cruzi* parasite is considered a generalist because of its diversity to infect a wide variety of mammal host species over large geographic regions. Moreover, because of high levels of genetic diversity found in *T. cruzi*, it has been labeled as a complex rather than a single species and is divided into six direct typing units (DTUs I-VI) (Devera et al., 2003). Each direct typing unit is associated with different geographical regions, mammal host, triatomine species, and clinical complication resulting from the Chagas disease. Each typing unit corresponds to

different medical complications in humans, for example: complex DTU I corresponds to only cardiac complications; complex DTU IV corresponds to both cardiac and digestive complications; and complex DTU VI corresponds to only digestive complications in its host. Current opinion on the effects of different *T. cruzi* strains in different triatomine species suggests that there is no change in fitness between the infected and uninfected, except from random external pressures (labeled "subpathogenic"). In contrast, recent studies on the effect of *T. cruzi* infection in triatomine hosts suggests a decrease in survival value, reproduction, and complications during the molt phase (Botto-Mahan et al., 2008). Contradiction of opinions are expected because of the inherent genetic variability *T. cruzi* exhibits in association with the various clinical complications found in mammal hosts; and thus, may be expressed similarly in triatomine hosts.

The Rio Grande Valley

Chagas disease was previously endemic only to the Latin Americas' but is now distributed throughout the world creating a global pandemic and can be found in the all the following regions: South America, Central America, North America, Europe, Asia, Australia, and Japan (Schumis and Yadon. 2010; Jackson et al., 2014). As previously mentioned, 12 species of kissing bugs inhabit the US, and 7 species can be found throughout Texas. In the southern United Sates (mainly Texas), it was found that the prevalence of triatomine infection with the *T. cruzi* parasite in 1510 triatomines was as high as 54.4% among 6 different species of triatomine vectors (Curtis-Robles et al., 2018). In Texas alone, 439 out of 694 kissing bugs submitted for testing were positive for *T. cruzi* infection (63.3%), with 85.7% of submissions of species *T. gerstaeckeri* and *T. sanguisuga* (Curtis-Robles et al., 2015). South Texas has also become an area of endemicity for species of kissing bugs that express a high prevalence for *T.*

cruzi infection, with an increased projected distribution as a result of climate change (Garza et al., 2014). The two prominent kissing bug species that are endemic to Southern Texas and most distressing to the local communities in south Texas because of the high rate of infection with the *T. cruzi* parasite are *T. sanguisuga,* and *T. gerstaeckeri* with a combined prevalence of 56.5% (Garcia et al., 2016). These two species of kissing bugs are worrisome for the residents of the Lower Rio Grande Valley because of the medical complications that can manifest if they successfully transmit the parasite in an encounter. The total population of the LRGV is exceeding 1,305,782 with urbanization increasing rapidly, and the presence of areas such as colonias (low-income, informal housing, and primarily hispanic communities) make urgent the need to inform the local community on how to prevent and control Chagas disease (United States Census Bureau, 2012; Larson, 2002). With the population in the LRGV increasing rapidly and much of the population living in rural communities, a greater risk for *T. cruzi* transmission exists because of the close proximity to sylvatic transmission cycles (Gunter et al., 2017).

Our main goal was to assess the level of understanding and knowledge that local communities in the LRGV have on Chagas disease and its vector using a brief questionnaire. Our hypothesis stated that local communities do not have sufficient information on Chagas disease and its insect vector. An additional goal of ours was to collaborate with Regional community organizations and community centers across the LRGV in hope to establish sound educational programs on Chagas disease. Part of this process was to disseminate accurate information provided by the Center for Disease Control (CDC Pamphlet) to community leaders and directors in several cities so the information can be promptly conveyed to the public. Collaborations and coordinated efforts with university researchers, state health departments, and the general public offered and will continue to offer opportunities for integrated pest management, research, and

protection of human health; moreover, will increase our understanding of vector ecology (Curtis-Robles et al., 2015).

CHAPTER II

MATERIALS AND METHODS

The Questionnaire

To assess the level of understanding of residents in the LRGV, a 19-question survey was created to determine their level of knowledge and comprehension of Chagas disease and the kissing bug endemic to the valley. The questionnaire was carefully structured in such a way that it would reveal correlations between the questions tested; moreover, it would disclose novel ideas as to why these patterns exist. The structuring of the survey facilitated an analysis of the data that would lend an insight as to why residents in several cities across the LRGV have or don't have knowledge pertaining to Chagas disease and the kissing bug.

The survey was written in both English and Spanish to accommodate the high proportion of Spanish speaking residents in the LRGV. This measure ensured there were no biases in the selection process of participants and feasibility to answer the survey. The questionnaire was divided into three distinct sections: the first section assessed the demographics of the participant and included the city of their home/apartment (Appendix A); the second section was composed of questions that evaluated the participants household, outside living conditions, and time spent outdoors (Appendix A); the third section assessed the amount of knowledge, level of understanding, and awareness local participants had on Chagas disease and the kissing bug (Appendix A).

Training and Certification

To survey several communities in the LRGV, necessary training and certification were required prior to the start of the research. It was necessary to ensure that the methods of retrieval for the questionnaire were ethical, as well as the questionnaire itself. CITI program training for ethics and compliance were required for each researcher on the project, including the principal investigator and presiding advisor. Completion and certification from the CITI program training were completed before the research commenced and were applied during the creation of the questionnaire.

To satisfy the protection of human rights, each question was carefully reviewed and selected so they would not violate nor harm the participants ethical rights. The participant was also able to decline to answer the questionnaire if wished. To protect the identity of each participant, name, address, nor coding was used in the cataloging of the surveys. Answered surveys were kept under lock and key in a locked research lab on the UTRGV Edinburg campus to maximize protection of identities. To satisfy the compliance of human rights, it was obligatory that participants were 18 years of age or older.

To conduct research utilizing UTRGV facilities and laboratories, a permit (ID # 2017-179-07; exp. 10/2020) allowing the project to proceed was required from the UTRGV Institution Review Board. A complete application was mandatory and included the following sections: outside affiliation disclosure form; consent form in English and Spanish; recruitment script in English and Spanish; and the questionnaire in English and Spanish. The application was submitted on July 17th, 2017 and board approved on October 27th, 2017. There was no outside funding or financial aid applied to this research project.

Sample Sites

The sites to conduct surveys were chosen to meet specific criteria to ensure a realistic sample of the population in the LRGV. Cities were selected to accurately represent the rural, urban, and agricultural qualities of the LRGV, as well as the various socioeconomic statuses found in the LRGV. Cities were also selected based on the total population per square mile; moreover, denser areas of population were chosen to achieve a more representative sample of the population. The cities selected had to reside in one of the following counties in the LRGV: Hidalgo and/or Cameron county. Hidalgo and Cameron are also the most populous counties in the LRGV. The cities that were chosen to represent the LRGV were comprised of: Edinburg; McAllen; Mission; San Juan; Alton; San Benito; Brownsville; Alamo; Donna; and Weslaco. Although cities in Willacy and Starr county were not included in the final analysis, we still believe that cities in Hidalgo and Cameron county was sufficient to represent a good exemplification of the total population in the LRGV.

To obtain access to different communities and gain confidence of the residents in each city where surveys were conducted, city leaders and directors were contacted by phone and email to organize meetings and/or presentations. This was completed utilizing the UTRGV Community Outreach Center in Edinburg. The meetings and presentations with city leaders and directors involved a briefing on the proposed research project, the questionnaire, and the process of dissemination of Chagas disease and kissing bug, as well as the suggested material to be conveyed. Regional community organizations such as La Union Del Pueblo Entero (LUPE), Arise Support Center (ARISE), Hope Family Health Center (HOPE), Valley Care Clinic, Renaissance Mobile Clinic, Proyecto Desarrollo Humano, San Carlos Endowment Center, and Alton Community Recreation Center were contacted and informed of the proposed research

project to acquire permission to conduct surveys at events and locations. Meetings were also assembled with residents from each city to demonstrate methods to be used to conduct the proposed research project. Researchers interviewed residents that were 18 years of age or older; no minors were interviewed or questioned for this research project.

Dissemination and Analysis of Data

Immediately after surveys were conducted at each location, every participant was given a debriefing about the questionnaire. Participants were also given an educational presentation on Chagas disease and the kissing bug by researchers. Post-survey dissemination of facts and information about Chagas disease and the kissing bug was obtained from the Center of Disease Control website (CDC Pamphlet - https://www.cdc.gov/parasites/chagas/resources/onepage.pdf) and information obtained in Dr. Feria's laboratory research seminars. Information was given post-survey so participants could gain an increased knowledge and understanding of a deadly tropical disease endemic to the area in hope to spread awareness vital to the control of additional transmission.

Each survey was entered in order into a statistical software program, IBM SPSS Statistics 25®, and direct correlations and relationships were found using the questionnaire data set. A two-way cross test was used to analyze two variables: knowledge of Chagas disease and highest level of education. A one-way test was performed to analyze if participants had prior knowledge of Chagas disease and/or the kissing bug before the survey. Pearson's Chi square tests were performed to analyze the distribution of each question in the data set and if correlations between the questions arose by chance. Pearson's correlation tests were performed to determine the significance and strength of the correlations between different variables in the data set.

CHAPTER III

RESULTS

We visited 9 local communities in the LRGV (Alamo, Alton, Donna, San Benito, San Carlos, San Juan, Edinburg, McAllen, and Weslaco) and worked with eight different community partners: LUPE, HOPE, UNIDOS, Valley Care Clinic, Renaissance Mobile Clinic, Proyecto Desarrollo Humano, Edinburg Endowment Center, and Alton Community Recreation Center. Door to door surveys were also conducted in the most populist cities in the LRGV (Edinburg, McAllen, and Mission). In total, 315 surveys were conducted in the research period from January to June 2018. Descriptive results demonstrated that less than 14% of participants knew about Chagas disease prior to the survey; therefore, 86% of participants in the LRGV were completely unaware that a deadly tropical disease exists in South Texas (Table 1).

Table 1. Number of participants having knowledge of Chagas disease prior to the survey in the LRGV.

Have you ever heard of the Chagas disease before this survey?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	13.3	13.3	13.3
	No	271	86.0	86.0	99.4
	Missing	2	.6	.6	100.0
	Total	315	100.0	100.0	

Descriptive results demonstrated that less than 15% of participants knew about the kissing bug prior to the survey; therefore, roughly 85% of participants in the LRGV were unaware that the vector existed in South Texas (Table 2). Missing values only resulted in a small percentage of total knowledge of participants.

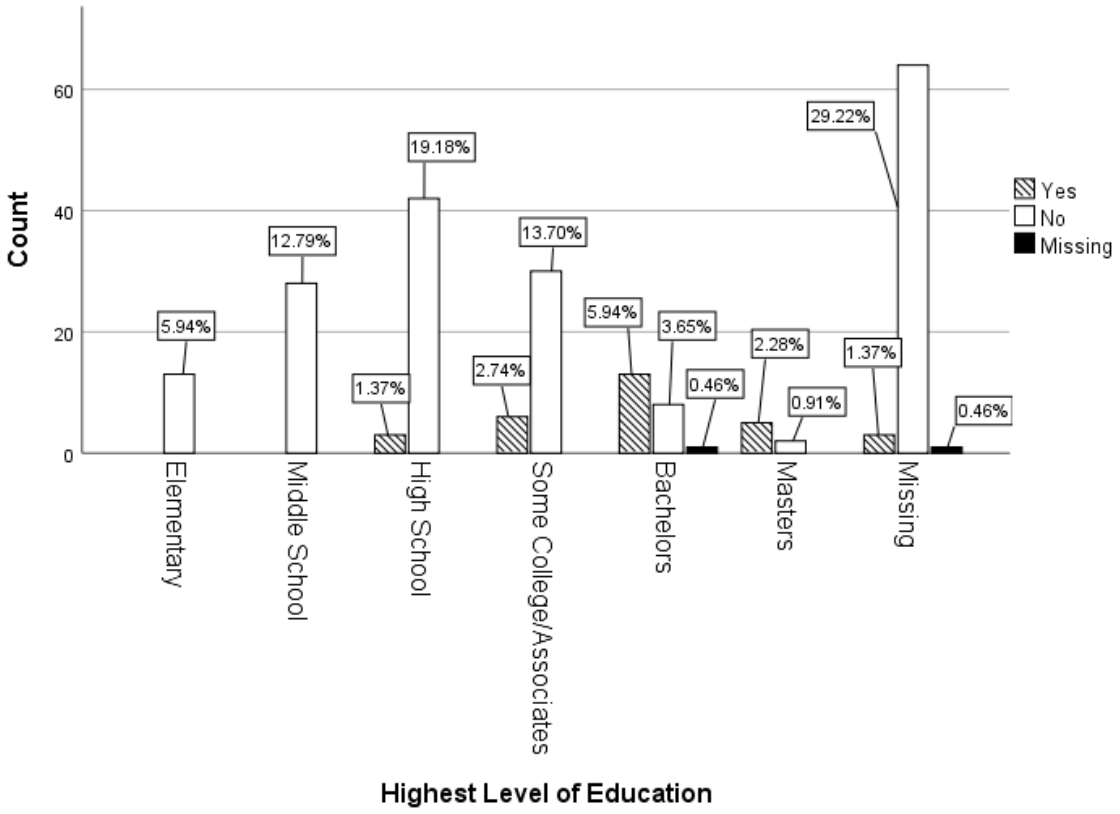
Table 2. Total number of participants having prior knowledge of the kissing bug prior to the survey in the LRGV.

Have you ever heard of a Kissing bug?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	14.3	14.3	14.3
	No	269	85.4	85.4	99.7
	Missing	1	.3	.3	100.0
	Total	315	100.0	100.0	

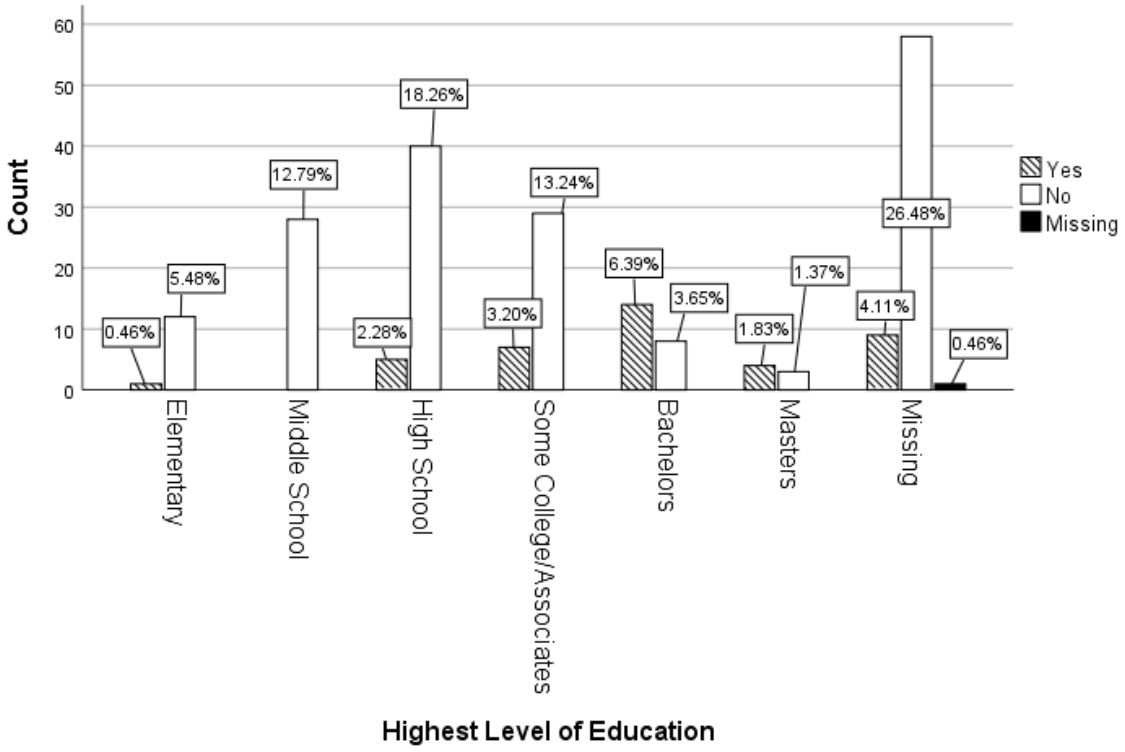
A comprehensive test on knowledge of Chagas disease prior to the survey based on education level of the participant demonstrated that majority of participants that had prior knowledge of Chagas disease were college educated to some degree; roughly 12% of total participants (Fig. 1).

Figure 1. Total number of participants having prior knowledge of Chagas disease prior to the survey based on highest level of education.



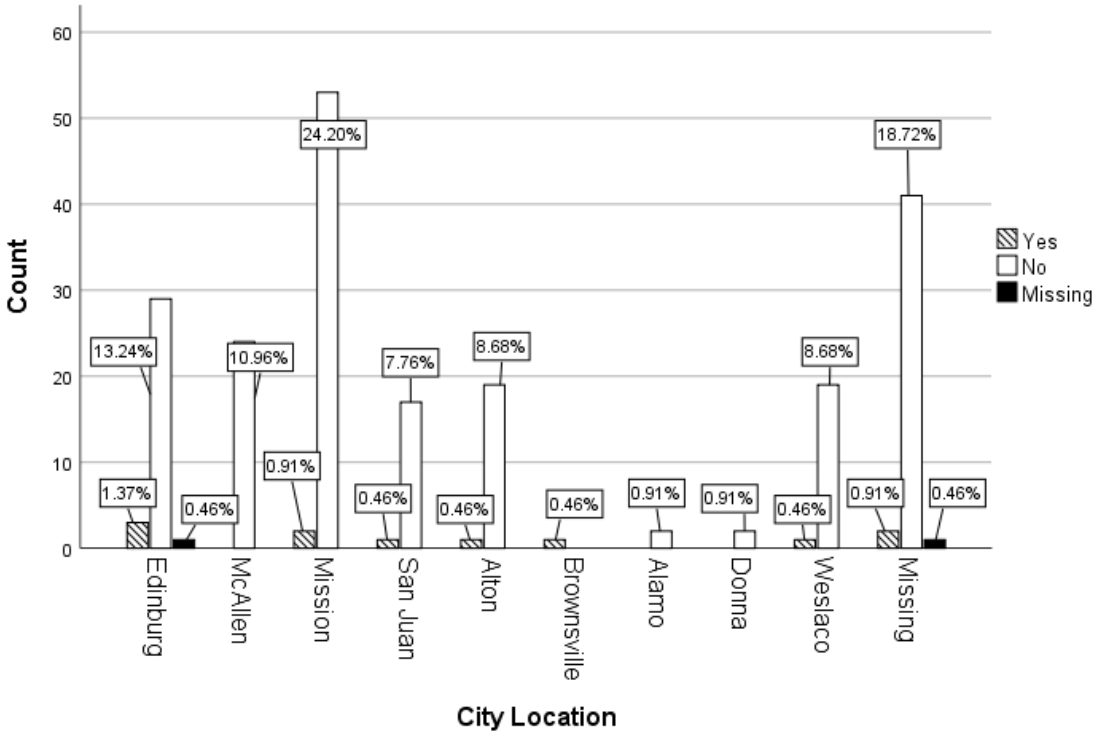
A comprehensive test on knowledge of the kissing bug prior to the survey based on education level of the participant demonstrated that majority of participants that had prior knowledge of the kissing bug were college educated to some degree; more than 85% of total participants (Fig. 2).

Figure 2. Total number of participants having prior knowledge of the kissing bug prior to the survey based on highest level of education.



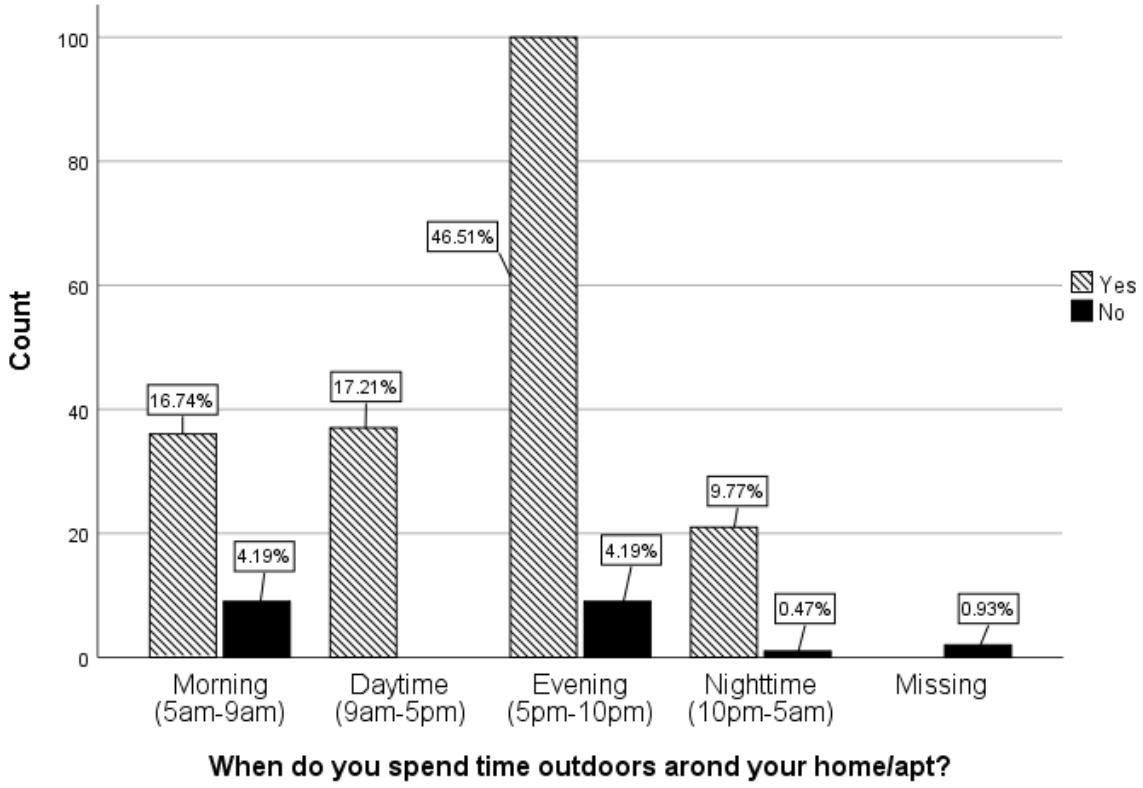
Results revealed that 94% of participants had not been previously approached by another researcher or public health official regarding Chagas disease or the kissing bug, regardless of location where the surveys were conducted (Fig. 3).

Figure 3. Number of participants that have been approached by another researcher or public health officials regarding Chagas disease or the kissing bug in any city surveyed.



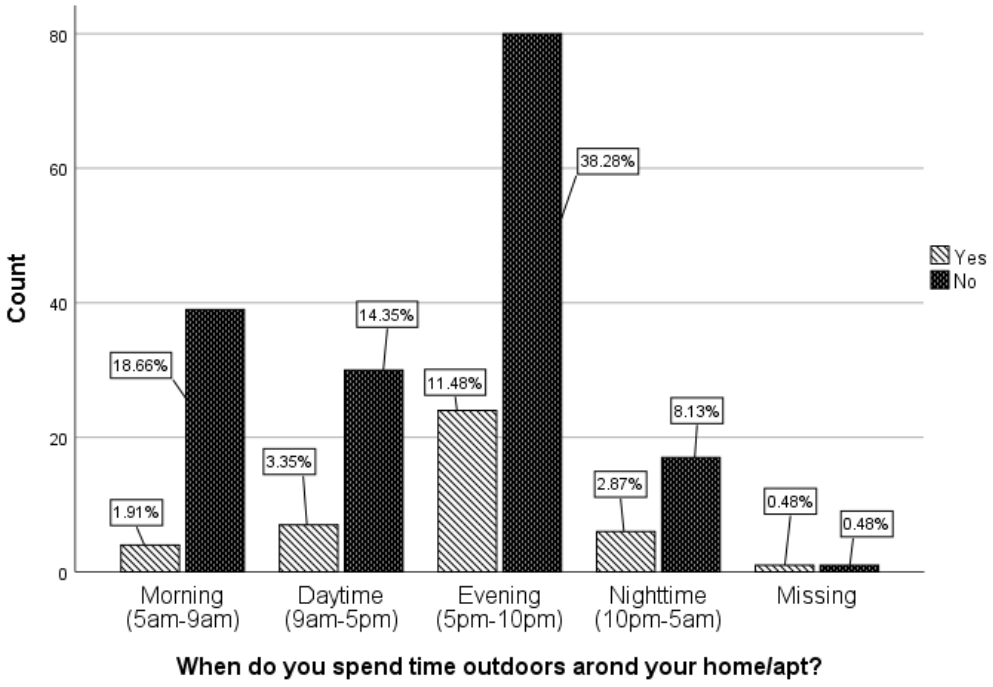
When participants were asked if they spend at least one hour outdoors weekly outdoors, more than 90% said they did; moreover, 56% of participants frequented outdoors in the evening and nighttime which is when the vector feeds (Wormington et al., 2018) (Fig. 4).

Figure 4. Percentage of participants that spend at least one hour outdoors per week and when they spend time outdoors.



Results demonstrated that 80% of participants do not use insecticide while outdoors. Results also demonstrated that out of 80% of participants that do not use insecticide, 46% frequent the outdoors in the evening or nighttime when the vector feeds (Wormington et al., 2018) (Fig. 5).

Figure 5. Time spend outdoors vs. whether participant wears insecticide while outdoors.



A Pearson's Chi square test was performed to determine the correlation between socioeconomic status vs. knowledge of Chagas disease. Results found these variables strongly correlated with a $p < .001$ and $x^2 (2) = 39.52$, with a critical value of 13.28 (Fig. 6).

Figure 6. Pearson's Chi-square test of socioeconomic status vs. knowledge of Chagas disease ($p < .001$; $x^2 (2) = 39.52$; $df = 4$).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.516[a]	4	.000
Likelihood Ratio	8.300	4	.081
Linear-by-Linear Association	38.045	1	.000
N of Valid Cases	315		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .03.

A Pearson's correlation test was performed to determine the significance and strength of the correlation between socioeconomic status vs. knowledge of Chagas disease. Results indicated a strong positive association with a $p < .001$ and a Phi = .354 (Fig. 7).

Figure 7. Pearson's correlation between socioeconomic status vs. knowledge of Chagas disease ($p < .001$; Phi = .354).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.354	.000
	Cramer's V	.250	.000
N of Valid Cases		315	

A Pearson's Chi square test was performed to determine the correlation between socioeconomic status vs. knowledge of the kissing bug. Results found these variables not correlated with a $p > .05$ and x^2 (2) = 7.676, with a critical value of 13.28 (Fig. 8).

Figure 8. Pearson's Chi-square test of socioeconomic status vs. knowledge of the kissing bug ($p > .05$; x^2 (2) = 7.676; df = 4).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.676[a]	4	.104
Likelihood Ratio	6.219	4	.183
Linear-by-Linear Association	.016	1	.900
N of Valid Cases	315		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .01.

A Pearson's correlation test was performed to determine the significance and strength of the correlation between socioeconomic status vs. knowledge of the kissing. Results indicated a weak positive association with a $p > .05$ and a Phi = .156 (Fig. 9).

Figure 9. Pearson's correlation between socioeconomic status vs. knowledge of the kissing bug ($p > .05$; Phi = .156).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.156	.104
	Cramer's V	.110	.104
N of Valid Cases		315	

A Pearson's Chi square test was performed to determine the correlation between being approached by another researcher and/or health professional vs. knowledge of Chagas disease. Results found these variables strongly correlated with a $p < .001$ and x^2 (2) = 61.125, with a critical value of 13.28 (Fig. 10).

Figure 10. Pearson's Chi-square test of being approached by another researcher and/or health professional vs. knowledge of Chagas disease ($p < .001$; x^2 (2) = 61.125; df = 4).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	61.125[a]	4	.000
Likelihood Ratio	21.988	4	.000
Linear-by-Linear Association	.016	1	.898
N of Valid Cases	315		

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .01.

A Pearson's correlation test was performed to determine the significance and strength of the correlation between being approached by another researcher and/or health professional vs. knowledge of Chagas disease. Results indicated a strong positive association with a $p < .001$ and a Phi = .441 (Fig. 11).

Figure 11. Pearson's Chi-square test of being approached by another researcher and/or health professional vs. knowledge of Chagas disease ($p < .001$; Phi= .441).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.441	.000
	Cramer's V	.311	.000
N of Valid Cases		315	

CHAPTER IV

DISCUSSION AND CONCLUSION

The financial burden of Chagas disease alone has reached 7.2 billion US dollars per year globally which is comparable to certain types of cancer (cervical), and other infectious diseases (cholera) and remains the largest parasitic burden to date (Urbina, 2014). The financial burden of Chagas disease in the US has reached upward of 118 million per year (Lee at al., 2013). Successful programs in Central and South America already exist to aid in the diagnosis, treatment, and propagation of information about Chagas disease, even with such high poverty levels at an average of 30.7% (CIA, 2018). Humanitarian organizations such as Doctors Without Borders (MSF) have been established in countries throughout Latin America since 1999, and have focused their attention on the diagnosis, treatment, and follow up of Chagas disease for the affected populations (Yun et al., 2009). However, in the process of establishing educational programs for residents in the LRGV, educational tools that are culturally relevant to the Rio Grande Valley are highly encouraged. Government aid must also be suitable and affordable to fit the socioeconomic status of most residents in the LRGV, especially since more than 33% live in poverty which is comparable to that of Latin America (US Census Bureau, 2016). Results showed that out of 315 surveys conducted, 271 participants (86%) were completely unaware of Chagas disease and the kissing bug before this survey. This indicates the need that we have in this area to elaborate sound-systematic programs to educate people about the disease.

Participants that possessed knowledge of Chagas disease or the kissing bug prior to the survey had some form of college education (85%), whether it was some college, associate degree, bachelor's degree, or master's degree; however, no participant surveyed retained a Ph.D. In addition, it is not clear whether the college educated participants aware of Chagas disease are passing on the knowledge and participating in the spread of awareness about the disease and its vector. These results demonstrate the need to educate the public prior to college, especially since majority of the LRGV never enters college, estimated at 70% of the total population in the most populist cities never enter college (US Census Bureau, 2016). MSF helped countries in Latin America, such as Honduras, Bolivia, and Guatemala from 1999 to 2008, to develop information, education, and communication modules (Villa et al., 2007). MSF, in collaboration with the Pan American Health Organization, also aided in the production of a virtual medical training course for the diagnosis and treatment of Chagas disease and the kissing bug (Pan American Health Organization, 2018). These virtual medical training courses could also prove useful to the general public to help in the identification of Chagas disease and its insect vector, the kissing bug.

After administering our surveys across different communities in the LRGV, preliminary results demonstrated that the knowledge on Chagas disease was minimal. Necessary and adequate education on Chagas disease has not been provided to our local communities by public health officials. Educational programs are essential in South Texas since Chagas disease is now considered endemic to the LRGV and harbors two prominent vector species that transmit potentially lifelong medical complications to the infected. Local health officials must take notice to improve community education and implement sufficient pest control in the LRGV, since 85 to 95% of the transmission of Chagas disease to humans is due to the insect vector bite. Continued

surveying, research, and educational presentations within the local community are necessary to ensure the prevention and spread of this deadly, neglected tropical disease. Awareness is the first line of defense against diseases that are transmitted and spread via vectors. Public health benefits are maximized when community engagement and citizen science are involved, which both aid in vector surveillance and control in areas that are endemic to Chagas disease (Curtis-Robles et al., 2015).

We are still in the process of conducting surveys and presenting educational information in several local communities across the LRGV and will continue to do so. It is important to continue this method of collaborative research between the university and local communities in the LRGV because this disease has been neglected for far too long; furthermore, it can absolutely be prevented with the correct approach. The US is lacking in educational programs, which is shameful when underdeveloped countries in the Latin Americas' already have much needed programs introduced to the public. Educational tools that are socially relevant to the Rio Grande Valley are highly encouraged as well to augment the understanding local communities can achieve with the information presented. Appropriate measures need to be taken by city, county, and state health officials to ensure the safety of our community and future generations to come. The efforts presented by UTRGV to inform the community of potentially deadly diseases, such as this one, must be continued to maximize the awareness and transmission of preventable diseases.

REFERENCES

Benjamin RJ, Stramer SL., and Leiby DA. "*Trypanosoma cruzi* infection in North America and Spain: evidence in support of transfusion transmission." *Transfusion* 52, (2012): 1913-21.

Bern, C., S. Kjos, M. Yabsley J., and S. Montgomery P. "*Trypanosoma Cruzi* and Chagas' Disease in the United States." *Clinical Microbiology Reviews* 24.4, (2011): 655-81.

Botto-Mahan, Carezza, Carmen Gloria Ossa, and Rodrigo Medel. "Direct and Indirect Pathways of Fitness-impact in a Protozoan-infected Kissing Bug." *Physiological Entomology* 33.1, (2008): 25-30.

Briceño-León, Roberto, and Jorge Méndez Galván. "The Social Determinants of Chagas Disease and the Transformations of Latin America." *Memórias Do Instituto Oswaldo Cruz*, vol. 102, no. suppl 1, (2007): 109–112.

Carmona-Castro, O., D. A. Moo-Llanes, and J. M. Ramsey. "Impact of Climate Change on Vector Transmission of *Trypanosoma Cruzi* (Chagas, 1909) in North America." *Medical and Veterinary Entomology*, vol. 32, no. 1, (2018): 84–101.

Coura, José Rodrigues, and Solange L De Castro. "A Critical Review on Chagas Disease Chemotherapy." *Memórias Do Instituto Oswaldo Cruz*, vol. 97, no. 1, Jan., (2002): 3–24.

Curtis-Robles, Rachel, Edward J. Wozniak, Lisa D. Auckland, Gabriel L. Hamer, and Sarah A. Hamer. "Combining Public Health Education and Disease Ecology Research: Using Citizen Science to Assess Chagas Disease Entomological Risk in Texas." *PLOS Neglected Tropical Diseases*, vol. 9, no. 12, (2015).

Curtis-Robles, Rachel, Lisa D. Auckland, Karen F. Snowden, Gabriel L. Hamer, and Sarah A. Hamer. "Analysis of over 1500 Triatomine Vectors from across the US, Predominantly Texas, for *Trypanosoma Cruzi* Infection and Discrete Typing Units." *Infection, Genetics and Evolution*, vol. 58, (2018): 171–180.

Devera, Rodolfo, Octavio Fernandes, and Jose Rodrigues Coura. "Should *Trypanosoma Cruzi* Be Called "*cruzi*" Complex? A Review of the Parasite Diversity and the Potential of Selecting Population after in Vitro Culturing and Mice Infection." *Mem. Inst. Oswaldo Cruz Memorias Do Instituto Oswaldo Cruz* 98.1, (2003): 1-12.

Dias, Jao Carlos Pinto, Aluizio Prata, and Dalmo Correia. "Problems and Perspectives for Chagas Disease Control: In Search of a Realistic Analysis." *Revista Da Sociedade Brasileira De Medicina Tropical Rev. Soc. Bras. Med. Trop.* 41.2, (2008): 193-96.

Dilma Do Socorro Moraes De Souza, Marialva TF Araujo, Paulo da Silva Garcez, Julio Cesar Branco Furtado, Maria Tereza Sanches Figueiredo, and Ruis M.S. Povoa. "Anatomopathological Aspects of Acute Chagas Myocarditis by Oral Transmission." *Arquivos Brasileiros De Cardiologia*, vol. 107, July (2016): 77–80.

Galvão, Cleber, Rodolfo Carcavallo, Dayse Da Silva Rocha, and Jose Jurberg. "A Checklist of the Current Valid Species of the Subfamily Triatominae Jeannel, 1919 (Hemiptera, Reduviidae) and Their Geographical Distribution, with Nomenclatural and Taxonomic Notes." *Zootaxa*, vol. 202, no. 1, (2003): 1.

Garcia, Melissa N., Sarah O'Day, Susan Fisher-Hoch, Rodion Gorchakov, Ramiro Patino, Teresa P. Feria Arroyo, Susan T. Laing, Job E. Lopez, Alexandra Ingber, Kathryn M. Jones, and Kristy O. Murray. "One Health Interactions of Chagas Disease Vectors, Canid Hosts, and Human Residents along the Texas-Mexico Border." *PLOS Neglected Tropical Diseases*, vol. 10, no. 11, 10 Nov. (2016).

Garza, Miroslava, Teresa Patricia Feria Arroyo, Edgar A. Casillas, Victor Sanchez-Cordero, Chissa-Louise Rivaldi, and Sahotra Sarkar. "Projected Future Distributions of Vectors of Trypanosoma Cruzi in North America under Climate Change Scenarios." *PLoS Neglected Tropical Diseases*, vol. 8, no. 5, (2014).

Gascon, Joaquim, Caryn Bern, and Maria-Jesus Pinazo. "Chagas Disease in Spain, the United States and Other Non-Endemic Countries." *Acta Tropica*, vol. 115, no. 1-2, (2010): 22–27.

Gunter, Sarah M., Kristy Murray, Rodion Gorchakov, Rachel Beddard, Susan N. Rossmann, Susan P. Montgomery, Hilda Rivera, Eric L. Brown, David Aguilar, Lawrence E. Widman, and Melissa N. Garcia. "Likely Autochthonous Transmission of *Trypanosoma Cruzi* to Humans, South Central Texas, USA." *Emerging Infectious Diseases*, vol. 23, no. 3, Mar. (2017): 494–497.

Hidron, A., N. Vogenthaler, J. I. Santos-Preciado, A. J. Rodrigue-Morales, C. Frando-Paredes, and A. Rassi. "Cardiac Involvement with Parasitic Infections." *Clinical Microbiology Reviews*, vol. 23, no. 2, (2010): 324–349.

Hotez, Peter J., Ashish Damania, and Mohsen Naghavi. "Blue Marble Health and the Global Burden of Disease Study 2013." *PLOS Neglected Tropical Diseases*, vol. 10, no. 10, (2016).

Jackson, Yves, Angie Pinto, and Sarah Pett. "Chagas Disease in Australia and New Zealand: Risks and Needs for Public Health Interventions." *Tropical Medicine & International Health*, vol. 19, no. 2, (2013): 212–218.

Klotz, John H., Patricia L. Dorn, Joy L. Logan, Lori Stevens, Jacob L. Pinnas, Justin O. Schmidt, and Stephen A. Klotz. "'"Kissing Bugs": Potential Disease Vectors and Cause of Anaphylaxis." *Clinical Infectious Diseases* 50.12, (2010): 1629-634.

Laranja, F.S., E. Dias, G. Nobrega, and A. Miranda. "Chagas Disease; A Clinical Epidemiologic, and Pathologic Study." *Circulation* 14, (1956): 1034-1060.

Larson, Jane E. “Informality, Illegality, and Inequality.” *Yale Law and Policy Review, Inc*. vol. 20, no. 1, (2002): 137-182.

Lee, Bruce Y, Kristina M. Bacon, Maria Elena Bottazzi, and Peter J Hotez. “Global Economic Burden of Chagas Disease: A Computational Simulation Model.” *The Lancet Infectious Diseases*, vol. 13, no. 4, Apr. (2013): 342–348.

Magill, A. J., and S. Reed. “American Trypanosomiasis.” *Hunter’s Tropical Medicine and Emerging Diseases* 8th Ed. W. B. Saunders Co., Philadelphia, P, (2000).

Moncayo, Alvaro. “Chagas Disease: Current Epidemiological Trends after the Interruption of Vectorial and Transfusional Transmission in the Southern Cone Countries.” *Memórias Do Instituto Oswaldo Cruz*, vol. 98, no. 5, (2003): 577–591.

Moncayo, A., and M. Yanine I. Ortiz. "An Update on Chagas Disease (Human American Trypanosomiasis)." *Annals of Tropical Medicine & Parasitology* 100.8, (2006): 663-77.

Organizacion Panamericana de la Salud. “Estimacion cuantitativa de la enfermedad de Chagas en las Americas. *Organizacion Panamericana de la Salud, Montevideo, Uruguay*, (2006).

Pan American Health Organization. Virtual medical training course in the diagnosis, management, and treatment of Chagas disease. Available: http:// www.paho.org/english/ad/dpc/cd/dch-curso-virtual-msf.htm, (2018).

Perez, Catherine J., Alan J. Lymbery, and R.C. Andrew Thompson. “Reactivation of Chagas Disease: Implications for Global Health.” *Trends in Parasitology*, vol. 31, no. 11, (2015): 595–603.

Pérez-Molina, José A., and Israel Molina. “Chagas Disease.” *The Lancet*, vol. 391, no. 10115, Jan. (2018): 82–94.

Rassi, A., Jr., A. Rassi, and W.C. Little. “Chagas' Heart Disease.” *Clinical Cardiology*, vol. 23, no. 12, (2000): 883–889.

Schmunis G.A., and Yadon Z.E. Chagas disease: A Latin American health problem becoming a world health problem. *Acta Trop*. 115 (2010): 14–21.

Schofield, C. J., D.M. Minter, and Robert J. Tonn. “The Triatomine Bugs--Biology and Control.” *World Health Organization, Vector Biology and Control Division*, (1987): 210-222.

Tarleton, Rick L. "Immune System Recognition of *Trypanosoma Cruzi*." *Current Opinion in Immunology* 19.4, (2007): 430-34.

Tarleton, Rick L. "CD8 T Cells in *Trypanosoma Cruzi* Infection." *Seminars in Immunopathology* 37.3, (2015): 233-38.

Urbina, Julio A. “Recent Clinical Trials for the Etiological Treatment of Chronic Chagas Disease: Advances, Challenges and Perspectives.” *Journal of Eukaryotic Microbiology*, vol. 62, no. 1, 13 Sept. (2014): 149–156.

US Census Bureau. “Income & Poverty; Poverty in South Texas.” U.S., (2016), www.census.gov/topics/income-poverty.html.

U.S. Census Bureau. “QuickFacts: Mission City, Texas; Edinburg City, Texas; McAllen City, Texas.” U.S. Census, (2016).

US Census Bureau. “Rio Grande Valley Census.” *Census.gov*, (2012), www.census.gov/.

Vasconcelos, R. H. T., E. Azevedo De A. N., G. Diniz T. N., M. Da G. A. De M. Cavalcanti, W. Oliveira De, C. Morais N. L. De, and Y. Gomes De M. “Interleukin-10 and Tumor Necrosis Factor-alpha Serum Levels in Chronic Chagas Disease Patients." *Parasite Immunol Parasite Immunology* 37.7, (2015): 376-79.

Ventura-Garcia, Laia, Maria Roura, Christopher Pell, Elisabeth Posada, Joaquim Gascon, Edelweis Aldasoro, Jose Munoz, and Robert Pool. “Socio-Cultural Aspects of Chagas Disease: A Systematic Review of Qualitative Research.” *PLoS Neglected Tropical Diseases*, vol. 7, no. 9, (2013).

Vicco, Miguel H., Franco Ferini, Luz Rodeles, Paula Cardona, Iván Bontempi, Susana Lioi, Juan Beloscar, Takeshi Nara, Iván Marcipar, and Oscar Bottasso A. “Assessment of Cross-reactive Host-pathogen Antibodies in Patients with Different Stages of Chronic Chagas Disease." *Revista Española De Cardiología* (English Edition) 66.10, (2013): 791-96.

Vicco, Miguel H., Luz Rodeles, Agustina Yódice, and Iván Marcipar. "Chagas Disease, a Risk Factor for High Blood Pressure." *Blood Pressure* 23.6, (2014): 345-348.

Villa, Luís, Silvia Morote, Oscar Bernal, Daniel Bulla, and Pedro Albajar-Vinas. “Access to Diagnosis and Treatment of Chagas Disease/Infection in Endemic and Non-Endemic Countries in the XXI Century.” Memórias Do Instituto Oswaldo Cruz, vol. 102, no.1, (2007): 87–94.

Viotti, R J, Vigliano C., Laucella S., Lococo B., Petti M., Bertocchi G., Ruiz Vera B., and Armenti H. “Value of Echocardiography for Diagnosis and Prognosis of Chronic Chagas Disease Cardiomyopathy without Heart Failure.” *Heart*, vol. 90, no. 6, (2004): 655–660.

World Health Organization. “Chagas Disease in Latin America: An Epidemiological Update Based on 2010 Estimates.” *Weekly Epidemiological Record* 90.6, (2015): 33-44.

World Health Organization. “First WHO Report on Neglected Tropical Diseases: Working to Overcome the Global Impact of Neglected Tropical Diseases.” *World Health Organization*, Geneva, (2010): 5, 75-81.

World Health Organization. “The global burden of disease: 2004 update”. *World Health Organization*, Geneva, Switzerland, (2008). http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html

“World Poverty Rates.” *Central Intelligence Agency*, Central Intelligence Agency, 2018, www.cia.gov/library/publications/resources/the-world-factbook/fields/2046.html.

Wormington, Jillian D., Cassidy Gillum, Alyssa C. Meyers, Gabriel L. Hamer, and Sarah A. Hamer. “Daily Activity Patterns of Movement and Refuge Use in *Triatoma Gerstaeckeri* and *Rhodnius Prolixus* (Hemiptera: Reduviidae), Vectors of the Chagas Disease Parasite.” *Acta Tropica*, vol. 185, Sept. (2018): 301–306.

Yun, Oliver, M. Angeles Lima, Tom Ellman, Wilma Chambi, Sandra Castillo, Laurence Flevaud, Paul Roddy, Fernando Parreno, Pedro Albajar Vinas, and Pedro Pablo Palma. "Feasibility, Drug Safety, and Effectiveness of Etiological Treatment Programs for Chagas Disease in Honduras, Guatemala, and Bolivia: 10-Year Experience of Médecins Sans Frontières." *PLoS Neglected Tropical Diseases*, vol. 3, no. 7, (2009).

APPENDIX

APPENDIX

CHAGAS DISEASE QUESTIONAIRRE

UTRGV

Chagas Disease (CD) Survey

(Survey is to be read and completed by the assigned interviewer)
Do you consent to participate in this survey? Y/N
(If no, then leave survey blank and move on to next subject)
Has the subject been given a copy of the interview consent form? Y/N
Subject Age:___ Subject Gender:___ Ethnicity:_____ Highest Level of Education:_____
Date: _____ Time: _____ Interviewer: _____
Location (City): _____

Thank you for your participation in this survey, I would like to ask you a few questions regarding your household. (circle all that apply)

1. Do you spend at least one hour a week outdoors around your house/apartment?
   A. Yes B. No

2. When do you spend time outdoors around your home/apartment?
   A. Morning (5am-9am)
   B. Daytime (9am-5pm)
   C. Evening (5pm-10pm)
   D. Nighttime (10pm-5am)

3. About how many hours do you spend outdoors around your house/apartment weekly?
   A. Less than 1 hour
   B. From 1 to 5 hours
   C. From 5 to 10 hours
   D. More than 10 hours

4. Do you use insect repellent when outdoors? (i.e. Repel, OFF)
   A. Yes B. No

5. Does your house/apartment have…
   A. Air conditioning? Yes ___ No____
   B. Screened windows? Yes ___ No____
   C. Screened doors? Yes ___ No____

6. Does your house/apartment contain items in the yard such as firewood bundles, old furniture, old tires, chicken coops, or dog kennels?
   A. Yes B. No

7. Does your house/apartment contain wild or domestic animals such as dogs, cats, rabbits, chickens, horses, or cattle?
   A. Yes B. No

Now, I will now ask you some questions relating to Chagas Disease and the Kissing bug (circle one, if applicable).

8. Do you know if Chagas disease is present in the U.S.?
   A. Yes B. No

9. Do you know if there is a cure or vaccine for Chagas disease?
   A. Yes B. No

10. Do you know how the Chagas disease is transmitted? If yes, how?
    A. Yes B. No

11. Have you ever heard of the Chagas disease before this survey?
    A. Yes B. No

12. Have you heard of a Kissing bug?
    A. Yes B. No

13. Have you ever seen a Kissing bug? If yes, where? (General Location)
    A. Yes B. No

14. Can you determine which, if any, is a kissing bug? (See Attachment A)

15. Have you or anyone that you know been bitten by a Kissing bug? If yes, when?(D/M/Y)
    A. Yes B. No

16. Did you know that Kissing bugs live in and around items such as those mentioned in this survey? (Firewood bundles, old furniture, old tires, chicken coops, or dog kennels)
    A. Yes B. No

17. Did you know that Kissing bugs feed on animals such as those mentioned in this survey? (Dogs, cats, rabbits, chickens, horses, or cattle)
    A. Yes B. No

18. Has another group of researchers or public health professionals talked to you about Chagas disease? If yes, when?
    A. Yes B. No

19. Did you find this survey informative and beneficial to your knowledge about Chagas disease and Kissing bugs?
    A. Yes B. No

BIOGRAPHICAL SKETCH

My name is Adam Dennis Wiejaczka, my mailing address is P.O. Box 3094 Edinburg, TX 78540, and my email is adam.wiejaczka01@gmail.com. I attended University of Texas Rio Grande Valley for my undergraduate degree. I chose a pre-medical road map to earn a degree in a Bachelor of Science in biology, with a minor. I majored in biology and minored in chemistry. I graduated with a (BS) in Biology from UTRGV in December 15' and received a Magna Cum Laude honor for my coursework. In Spring 16', I was a TA for chemistry and was required to teach a lesson, as well as a demonstration for each lab.

I entered the Master of Science program in biology in Fall 16'. My studies in the program were concentrated on epidemiology and vector entomology; specifically, Chagas disease and the triatomine bug. I have worked and completed research under the supervision of Dr. Teresa Feria-Arroyo. I have been a Graduate TA for Anatomy and Physiology II at UTRGV and have worked on a bi-national project between Mexico and US involving Zika. During my work and research, I have been trained in field techniques such as: mosquito egg trapping and collection; reduviid trap setup, collection, and freezing procedures; and public communication for ethical research. I have been trained in laboratory techniques such as: mosquito egg identification and calculation; reduviid dissection; PCR identification of reduviid species and *T. cruzi*; and statistical analysis using SPSS. I placed second in the COS 18'Conference Biology Division and have also had a Channel 4 News RGV story featured on my Chagas disease research in April 18'. I will earn a Master of Science degree in Biology in August 18' with a 4.0 GPA.