



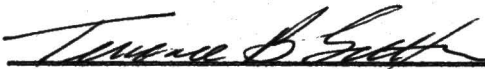
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Traditional environmental health practices focus on education and exposure prevention, but the division between the biophysico-chemical and social environment keeps them from always being sufficient; human ecology seeks to bridge this division. The second leading cause of mortality in Guatemala is gastrointestinal infections, and San Pedro, Guatemala, provides an opportunity to study these infections utilizing a human ecological approach. Morbidity data were collected from the local health center, observations noted systematically, and both residents and tourists were interviewed regarding their perceptions of the community's environmental health. Results found that residents who had no contact with tourists stated that, for gastrointestinal infections due to refuse in the streets, education alone would not be sufficient to reduce this problem; most felt some type of government intervention would be necessary. It is recommended that public health specialists employ a human ecological approach and refer to the community when designing an appropriate intervention.

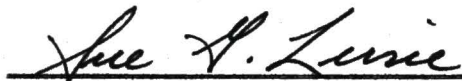
**IS AN ENVIRONMENTAL HEALTH EDUCATIONAL INTERVENTION
SUFFICIENT TO CHANGE BEHAVIOR?: PERCEPTIONS FROM AN
INDIGENOUS LAKE COMMUNITY IN GUATEMALA**

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CHAPTER ONE

INTRODUCTION

Traditionally, environmental health practice focuses primarily on health promotion through education about risk factors (i.e. smoking) or on preventing exposure to environmental hazards (i.e. microbiological contamination), and within this practice there is a division between the biophysico-chemical and social environment. However, in recent years new approaches such as social epidemiology and human ecology have tried to unite the biophysical with the social environment to develop successful environmental health practices. Human ecology, in particular, is a useful theoretical framework for understanding environmental health issues such as gastrointestinal pathogens (Parkes, Panelli, & Weinstein, 2003), and coupled with ethnographic fieldwork, it can provide the foundation for developing an appropriate public health intervention that may not focus on education or exposure prevention alone.

By eliminating the line between biophysico-chemical and social environment, successful interventions can be developed that help combat illnesses due to gastrointestinal pathogens, which remain a leading cause of morbidity and mortality

throughout developing countries, including Latin America (World Health Organization [WHO], 2006). According to the Pan American Health Organization ([PAHO], 2006), there is still a significant problem with infectious intestinal diseases in Latin America, generally associated with poor water quality and poor sanitation. Among Central American women, intestinal infections are ranked as the 5th leading cause of mortality, and for the whole population in Guatemala specifically, intestinal infections are ranked as the 2nd leading cause of mortality. In Guatemala, the mortality rates in rural areas are still much higher than those in urban areas (Goldman, Pebley, & Beckett, 2001).

Background

San Pedro La Laguna (San Pedro) is one of thirteen Mayan villages located on the shores of Lake Atitlan in the Department of Sololá, Guatemala. According to the Instituto Nacional de Estadística (INE) in 2002, the population of San Pedro was 9,034. Of this population, 7,616 were under the age of seventeen. The town is divided into six neighborhoods known as *cantónes* (see Figure 1). *Cantón Chuacante* is the largest of the neighborhoods and includes the docks to *Panajachel* and *Santiago*, most of the town's shoreline, and up to the *Centro de Salud* (health center). This area is mainly commercial, but some of the buildings function as both businesses and homes, making it the most populated area in town. Businesses in this area cater primarily to tourists with many restaurants and hotels located along the shore of the lake. *Cantón Chuasanahí* is primarily residential and the next most populated neighborhood. Extending from the road leading to the *Santiago* dock up to the church and back into town a few blocks,

many expatriates have started to develop their residences here, along with hotels and small shops encouraging tourism as well. *Cantón Pacucha* is much smaller than the previous neighborhoods described and is primarily residential, with a few practical businesses such as a mechanic shop, tailor, and funeral casket supplier. *Cantón Tzanjay* is also primarily residential and acknowledged by all interviewed as the poorest neighborhood in the town. *Cantón Pachanay* and *Cantón Bella Vista* are two relatively new neighborhoods. *Cantón Pachanay* leads up along the shore, picking up where *Chuasanahí* leaves off. This area, up until ten years ago, was used largely for agricultural purposes. As the town of San Pedro grew, people moved out to this area and established several Spanish schools to encourage tourism. These Spanish schools provide Spanish language lessons and assist with arranging places for tourists to stay. *Cantón Bella Vista* is part of the countryside of San Pedro, primarily agricultural, and individuals in this neighborhood were not accessible to the researcher due to their location.

As San Pedro continues to grow and develop, the culture and environment of the town continue to change due to an increase in foreign influence. San Pedro ranks within the top three spots in the area for tourists to visit, and for the past few years, the town's development of inexpensive Spanish schools, room, and board make it a mecca for "The Backpacker" tourist. Because of the beautiful scenery and the friendly indigenous people, it has also become a haven for expatriates from all over the world. The increase in tourism and the influx of expatriates to the town has caused San Pedro to become visibly divided. Expatriates who have established hotels, restaurants, travel agencies, and Internet cafes primarily own the land in *Cantón Chuacante* along the shore and in

between the two docks in the town. Once up the hill, on the main road that leads into the town itself, one is unlikely to find very many tourists. Throughout the past decade, as tourism has substantially increased as a significant source of income, there has been a concomitant increase in interest by foreigners in the welfare of the town.

One of the major obvious issues in the town is the amount of refuse in the streets. This refuse also attracts a large number of flies, which are common vectors of enteric diseases such as dysentery. These flies can be found in restaurants and in the market area where they readily land on foods being consumed by humans. It is because of this that the issue of refuse becomes a grave public health concern for both residents and tourists. However, in order to know how to address this issue, it is crucial to ascertain how the community views the trash in the streets. Both residents and tourists of the town were found to view the refuse as a problem, but each group has differing ideas on how best to combat the problem.

Statement of Purpose

In a partial response to the high levels of intestinal infections associated with refuse in the streets, this project began as a collaborative effort between the researcher and Vivamos Mejor, a non-governmental organization (NGO) focusing on developing sustainable tourism in the rural communities around Lake Atitlan, Guatemala. Vivamos Mejor sought appropriate interventions for the towns around the lake and needed to know how receptive members of the town of San Pedro would be to attending classes on how to keep their environment sanitary and themselves healthy. This endeavor provided an

opportunity to utilize a human ecological approach. In order to evaluate the community's receptivity, the researcher had to develop an understanding of the community and what they viewed to be the major health problems for the area.

The purpose of this study is to present the views and concerns of the local population in San Pedro regarding environmental health issues. Specifically, this study looks at community perceptions of refuse in the streets and what could be done to improve the health of the people in this community. To accomplish this it was necessary to discover the perceptions of the community regarding refuse and its connection, along with poor hygiene, to transmitting enteric diseases through an overabundance of flies. It was hypothesized that the neighborhood with the highest amount of refuse in the streets would attract a larger number of flies and therefore have the greatest incidence of enteric diseases; this neighborhood would be in most need of education on sanitary practices.

Research Questions

There were two main research questions guiding this project:

- How does the community of San Pedro view the amount of trash in the streets as a factor in the overall health of their community?
- Is an educational intervention on sanitary practices for local residents sufficient to help reduce the prevalence of gastrointestinal illnesses commonly associated with poor sanitation?

Delimitations

This study was conducted from May 15 to July 15, 2004. The study population included adults aged 16 to 86 who were residents of San Pedro, Guatemala or tourists traveling by themselves or in small groups. Only Spanish and/or English speaking individuals were included in this study. Due to the unavailability of an interpreter, individuals who spoke only Tzutujil, the local Mayan language, were excluded. Residents of neighborhoods *Canton Chuasanahí*, *Canton Chuacante*, *Canton Pachanay*, *Canton Pacucha* and *Canton Tzanjay* were included.

Limitations

Starting with the matriarch of the family with whom the researcher lived during the study period, individuals who were interviewed were asked to provide the name of someone else from the town to interview in a “snowball” sampling technique. Individuals were categorized by the neighborhood in which they resided. Since individuals who spoke only Tzutujil were excluded, as noted in the delimitations section, this study is limited by the lack of individuals representing *Canton Tzanjay*, a predominantly Tzutujil speaking population. Perception data from this community neighborhood is minimal in this study. However, this neighborhood is also one of the smallest, and a sufficient sample size for an adequate representation of the neighborhood is unclear.

As mentioned previously, the most current published census information was for 2002 with an official population of 9,034 for San Pedro, of which 7,616 were children.

However, the mayor's office stated that there had been a 4000-person increase in the population from 2002 to 2004. The mayor's office did not have any specific information on households in each neighborhood. This made it difficult to assess how many individuals should be interviewed to give a fair representation of the views of each neighborhood.

Female representation in this study was limited due to some of the traditional cultural roles of gender within the community. Many females stay at home kept busy with indoor housework and were not easily approachable within the study period. It is possible to find a large number of females in the market area; however, the majority of vendors are not from San Pedro, and they are usually too preoccupied with trying to sell their wares, while the ones who are from San Pedro are usually too busy buying goods for their household.

Men also were at times difficult to interview. Though many males are found in all parts of town, either sitting out on their porch step or sitting in the center of town, again due to traditional gender roles within the community, it is not common for young women to approach men in the streets, especially if the male is young and/or single. However, the gender limitations could have been overcome if the study had been of a greater length of time, and the researcher had more time to establish herself as a researcher within the community. As many individuals as possible were interviewed in the short period of time allotted for data collection, and given the limitations, every attempt possible was made to interview individuals from both genders for a wide range of

ages. The sample population is a broad representation of both genders of various ages from different backgrounds within the community.

Due to time conflicts, views from the mayor's office are not represented.

Attempts were made to make contact with the representatives of the *Comision de Consejo* (Council Committee) regarding the health and the environment of San Pedro. However, since this research focuses on the concerns of the people of the community, the inability to speak with representatives involved primarily in politics is not a severe limitation.

Assumptions

For the purpose of this study, it was assumed that:

- Participants understood the purpose of the study and the interview questions.
- All participants answered honestly

Definition of Terms

Backpacker Tourist – type of tourism, also referred to as “low-end,” where individuals or small groups of people travel lightly, requiring minimal accommodations, and relying on local goods and services (Chambers, 2000).

Ethnographic fieldwork – approach to data collection in communities and other social settings used to investigate social and cultural patterns. The researcher plays an active part in the community in order to collect data (Schensul, Schensul, & LeCompte, 1999).

Free list- technique used to help identify cultural domains where an informant is asked to give a qualitative list of all words associated with a certain category. Words listed can then be evaluated for terms of frequency (Schensul et al., 1999).

Human ecology- study of human-environment interactions by crossing the lines between “nature and culture” or “environment and society” (Parkes et al., 2003)

Participant Observation- a process within ethnographic fieldwork where the researcher lives and actively participates in the community being studied (DeWalt & DeWalt, 2002).

Pile sort- free list responses can be written on cards and further sorted into piles, which are grouped into factors or domains per the perception of the informant (Schensul et al., 1999), i.e. how illnesses are viewed.

Refuse – discarded household materials that include both trash (“dry” goods such as newspapers and cans) and garbage (“wet” goods such as food remains and yard waste), often used interchangeably in speech with trash and garbage (Rathje & Murphy, 1992), used interchangeably in this text with “trash.”

Snowball sampling- a process where the researcher asks one or more key individuals to provide them with names of other individuals who would be likely research participants,

in order to establish social networks and reach difficult-to-find populations. (Bernard, 2002).

Time Allocation- method of systematically observing activities of individuals in the community (Bernard, 2002).

Importance

As will be noted in the subsequent chapter, a minimal amount of research has been done in San Pedro specifically regarding the environmental health of the community. Previous research in the Lake Atitlan area had focused primarily on testing for water contamination or the incidence of illness in other towns. Few studies have looked at community perceptions of sanitation needed to establish culturally appropriate interventions. Of these studies, San Pedro is not included specifically or even is the Lake Atitlan area in general included. Since infectious enteric diseases remain as a leading cause of mortality in Guatemala, a community participatory approach is important to understand how the community views this public health concern in order to minimize mortality due to intestinal infections in the future.

CHAPTER TWO

LITERATURE REVIEW

Human ecological theory sets the framework for this research, which presents societal perspectives on sanitary practices to minimize the spread of enteric diseases prevalent in developing communities such as San Pedro, Guatemala. By addressing environmental health within the context of culture and society, appropriate public health interventions can be implemented within a receptive community. Traditional interventions have often relied on educating the community, but these are not always the most appropriate. Societal and cultural factors, such as availability of resources and perceptions of illness, should be taken in to consideration when developing an intervention. The literature review looks at 1) common environmental health problems within Guatemala and 2) public health interventions focusing on education within the context of culture and society.

Environmental Health

There is still a significant problem with enteric diseases in Latin America, in particular Guatemala, and as mentioned in the previous chapter, PAHO lists infectious

intestinal diseases as the number two cause of mortality in Guatemala. These infectious diseases are commonly associated with parasitic agents in conjunction with poor water quality and poor sanitation (Bentley, 2004; Sobel, 1998). In Guatemala City, a study from the Centers for Disease Control (CDC) showed that interventions including hygienic education and water purification methods have been helpful in reducing fecal coliform bacteria and *Escherichia coli* contamination of street-vended foods and of beverages (Sobel, 1998). However, in this study, the necessary water-purifying vessel system was provided to all street vendors studied by the CDC and is not readily available to vendors in rural areas not studied. While the CDC found the water purifying system to be useful in an urban area, the question remains if it would be as successful in rural areas where there is a higher rate of intestinal infection and less available resources.

Although the combination of resources and education proved to be beneficial in the study from the CDC, education/knowledge alone was not sufficient to promote healthy sanitary practices in a study from Princeton. Noreen Goldman and her research team studied the beliefs of and attitudes toward the causes of childhood diarrhea in rural Guatemala. Her group found that only 35% of women who attributed pathogens and poor hygiene to part of the causation of diarrheal illnesses actually kept clean households to minimize the spread of disease. This was compared to the 25% of women who also kept clean households but gave other reasons such as eating too much or eating too little as the cause of childhood diarrhea (Goldman, 2001).

According to the WHO (2006), Guatemala has a mortality rate of 13.1% for children under five dying of a diarrheal disease. A two-year study from Nova

Southeastern University obtained health data from children in two different towns along the shore of Lake Atitlan, San Antonio Palopo and Santa Catarina Palopo. The study indicated that 40% of the children who presented with diarrhea and/or abdominal pain were infected with *Cryptosporidium*. However, the presence of diarrhea and/or abdominal pain alone was not a clear indicator of infection with *Cryptosporidium* (Bentley, 2004). This indicates that while many cases of childhood diarrhea are associated with infectious agents, like *Cryptosporidium*, not all can be attributed to this infection and should be further characterized for appropriate diagnosis, treatment, and need for official public health intervention.

Culture and Society

As anthropologist Benjamin Paul has noted, community-based approaches to establishing interventions are key to the success of the intervention within the community, and San Pedro is no exception. Key players and how they are perceived within the community must be identified. These players must first evaluate how the community views a particular problem and how they will respond to the proposed solution (Paul, 1984).

Interventions must be designed to address problems that the community actually views to be a problem. Behavioral change towards health is dependent on the health belief systems of the community, and an imposed intervention based on a differing belief system will not be productive. Goldman's study reports that while a belief in "folk" illnesses (i.e. "*Mal de ojo*" or "evil eye") has diminished slightly in rural Guatemala,

there are still varying beliefs outside of the Germ Theory of Disease in causality of diarrheal illnesses that should be taken into consideration when establishing any type of intervention.

Besides understanding exactly how a community views a certain public health problem, other factors to consider when developing an intervention include the availability of resources and its general practicality. Anthropologist Linda Hunt gives an example of an environmental health intervention that failed when certain societal factors were not taken into account in designing the intervention. Hunt's group surveyed agricultural workers who sprayed pesticides in Chiapas, Mexico, about the lack of use of protective equipment. Public health efforts had focused on teaching the workers about the dangers of pesticides and how to properly handle them, and Hunt found that the workers knew exactly how to handle the pesticides but did not use the protective equipment due to expense and discomfort (Hunt, Ojanguren, Schwartz, & Halperin, 1999).

Another similar example is given by Paul Farmer who cites various studies on tuberculosis treatment attributing lack of compliance to availability of resources and not to lack of education. When medications were made readily available and clinics were open at hours convenient to the patients, treatment compliance doubled in some cases. Educational interventions stressing the need for treatment compliance had little effect, and generally speaking, the efficacy of educational interventions alone has yet to be proven in any study (Farmer, 1999).

Summary

While organizations such as PAHO have statistical data on mortality due to infectious diseases, there is very little data already published concerning the causation of enteric illness in rural Guatemala. Furthermore, literature on social and behavioral practices regarding hygiene is also minimal. However, it is clear that interventions focusing on education alone are not always appropriate given other factors including availability of resources, as noted in the Hunt et al (1999) and Farmer (1999) studies. Further studies are needed to measure the efficacy of culturally appropriate interventions within the context of environmental health.

CHAPTER THREE

METHODOLOGY

Population and Sample

This study was conducted from May 15 to July 15, 2004. The sample population included adults aged 16 to 86 who were residents of San Pedro, Guatemala, and tourists traveling by themselves or in small groups. Only Spanish and/or English speaking individuals were included in this study. Starting with the matriarch of the family with whom the researcher lived during her stay, adults interviewed were asked to provide the name of someone else from the town to interview in a “snowball” sampling technique. Due to the limited time available to collect data, the matriarch of the home stay was chosen as a starting point to help introduce the researcher to community members. Another “snowball” was started with an individual who worked within the tourist industry to obtain a different perspective from the community. This starting point was chosen to assist in discovering if exposure to foreign ideas and thought have influenced how members of the community perceived their health.

Individuals interviewed were categorized by the neighborhood in which they resided. A total sample of 35 residents was interviewed but only 22 were asked the full set of interview questions and categorized by neighborhood. The remaining 13 were health or education professionals who gave their expert opinion on health or educational problems in the community. Tourists surveyed were identified through a convenience sample. These tourists were found while at restaurants and other tourist meeting locations near the dock to *Panajachel*. A total sample of 13 tourists was surveyed.

Protection of Human Participants

Approval for this study was obtained from the Institutional Review Board for both the University of North Texas- Health Science Center and North Carolina State University. All researchers involved completed the appropriate Health Insurance Portability and Accountability Act (HIPAA) training as well as Good Clinical Practices (GCP) training.

All participants were asked to provide a verbal informed consent, and a clear understanding of the purpose and methods of the study was established before interviews were started. The identifiers for all interviews were removed before being coded, and all data provided by participants were stored in compliance with HIPAA legislation and GCP. Any identifiable data was stored in a password-protected electronic file. No personal health information was collected from the *Centro de Salud*.

Data Collection Procedures

Data were collected through an ethnographic fieldwork process of participant observation and open-ended interviews. Observational data looking at individual interactions within the environment were collected through time allocations performed at three different heavily traversed spots in town. Individuals from the community were surveyed and interviewed about their perceptions of the environmental health of the community, and their responses were transcribed and coded. Also, health statistics of incidence of disease amongst the people of San Pedro who went to the San Pedro health center from January to July 2004 were collected from the health center itself.

Time Allocations

Time allocations are a useful tool for the human ecological approach because they provide observational data on the interactions between the human community and the environment. Three fixed-spot time allocations, each at a different heavily traversed spot in town, were performed during the course of the study to observe these interactions. Due to time limitations, each spot was only surveyed once and for a minimum of five hours.

The first post chosen was a table located outside on the patio of one of the restaurants closest to the dock. From this vantage point, the researcher was able to look straight down to where the dockworkers usually sat conversing, awaiting individuals needing to travel to another point along the lake or awaiting arriving tourists from across the lake. Observations were noted on all the people who walked up and down the

beginning of the foot-path of the main hill going into town, as local tour guides tried to convince the newly arrived tourists to hike the volcano, ride on horseback, or take a kayak around the lake. During this particular time allocation, a large recycling bin was present, approximately 8ft long by 6ft wide by 2ft deep. A primary reason for this spot being chosen was to witness if the bin was utilized or not. Since then, the recycling bin has been relocated.

The second post chosen was on the side of the basketball court in the town center, seated against a wall; the whole court area was visible, surrounded by small vendors selling clothes and various food items. To the right was a walkway that connects the basketball court to the local market area. In this walkway was a recycling bin that more than likely is the same one mentioned above that had been moved, since there had not been a bin in this particular location when the researcher first arrived in town.

The third post was on the front steps of the Catholic Church. This was a common resting stop for the town as there were never fewer than a dozen people sitting on the steps, watching people come and go out of the central park area. It was also located on the main road where people waited for taxi trucks going into and out of town.

At each of these three posts, a traditional method of fly counting was utilized to attempt to quantify the fly population. An 8"x11" sheet of plain white paper was placed next to piles of refuse on the ground or next to dirty plates on a restaurant table. The number of flies that landed on the piece of paper within one minute was tallied.

Instrumentation

Interviews and surveys were utilized for direct questioning on the relationship between the society and the environment as part of the human ecological approach. Free lists and pile sorts, as defined in chapter 1, were employed for gauging the relationship between society and illness.

Interviews

Thirty-five people were interviewed either formally or informally throughout the course of this study. These people represented various parts of the community. Thirteen of these people were interviewed for background information as expert opinions on the health and education status of the community. Two were medical doctors in town, another a *curandero*, all three male. Two pharmacists were also interviewed, one male and one female. One woman represented a local educational organization assisting children with financial and educational needs, and one man was an expatriate business owner who had just recently started a trash collecting campaign. Six individuals were not originally from San Pedro and were not given the tourist survey since it either had not been developed yet, or as in the case of one of these individuals, I was not able to speak to him long enough to complete the survey. These individuals were a convenient sample of people, who verbally consented to let a conversation turn into an informal interview. Five were male and one female.

The remaining 22 individuals represent the different neighborhoods of the community. Half of the individuals interviewed were male, and half female. The ages

ranged from 16 – 86 years. Three of these were expatriates who now reside in *Canton Chuacante*. Two others interviewed also lived in *Chuacante* but were native to San Pedro. Eleven individuals interviewed represented *Canton Chuasanahí*, one of which was a *Guatemalteco* (native Guatemalan) and another an expatriate, while the other nine were native to San Pedro. Three individuals resided in *Canton Pacucha*. Two individuals lived in *Canton Tzanjay*, and the remaining one lived in *Canton Pachanay*. They were all asked a base set of questions and asked to elaborate on their answers through more specific questioning dependent on their answers.

Tourist Survey

Thirteen tourists were surveyed about their reasons for visiting San Pedro and their outsider's opinion of the health and environment of the town. This was a convenient sample consisting of two females and 11 males who were located near and around the dock to *Panajachel*. The age range was from 19 - 43. All thirteen participants were asked the same questions.

Free list/Pile sort

A list of illnesses was developed from the answers of interviews to identify how illness was perceived by the community. Separate cards were made for each term, and then put into piles in any way the interviewee felt was appropriate. With Spanish on one side and its English equivalent on the other, the eleven cards were marked: 1) *gastritis*, 2) *parásitos*, 3) *diarrea*, 4) *vomito*, 5) *disentería*, 6) *cólera*, 7) *dolor de cabeza*, 8) *gripe*, 9)

tos, 10) *fiebre*, and 11) *resfriado* [1) gastritis, 2) parasites, 3) diarrhea, 4) vomiting, 5) dysentery, 6) cholera, 7) headache, 8) flu, 9) cough, 10) fever, and 11) cold]. Twelve individuals were asked to put these cards in piles according to how the participant perceived the cards to relate to each other. For example, some individuals chose to put the cards in piles based on severity of illness, while others chose to categorize them by type of illness. Seven participants were local residents and five were tourists. Both residents and tourists were asked to participate in the pile sorting exercise to see if there were any significant differences in perception present in the piles sorted by the two groups.

Data Analysis

All field notes and responses to interviews/surveys were transcribed and coded in the field note program SIL Fieldworks 2.1 (SIL, 2004). Data were further grouped by question and type of response and then analyzed by systematically interpreting and categorizing phrases and concepts. These regrouped data were coded and entered into SPSS. Frequency tables were generated for responses from each neighborhood.

Summary

The methods employed in this research included techniques of ethnographic fieldwork, such as participant observation, to study the interactions between society and environment as part of a human ecological approach. Each neighborhood was presented through interviews of residents, and tourists were interviewed as a basis for comparison.

Methods employed included interviews, surveys, and free list/pile sorts. Time allocations were also used to observe the relationship between the people of the community and the environment.

CHAPTER FOUR

RESULTS

Through a process of participant observation utilizing a base set of questions and techniques such as free lists and pile sorts, residents of the San Pedro community were interviewed about their perceptions of the trash in the streets and how it affected, if at all, the health of their community. They were also asked what they considered to be a possible solution to the general health problems of the community. These perceptions will be presented categorically for the five neighborhoods represented as noted in the previous chapter. These were compared to the tourist perceptions of the trash in the streets and to the researcher's observations made through time allocations at various points throughout the community. Morbidity data were also collected from the health records of the *Centro de Salud* in San Pedro. These records only tally the data for the four main neighborhoods of the community. These data are presented for each of the neighborhoods and compared to how residents perceive the health of their community.

Time Allocations

Observational data of the environment were collected through time allocations. At one point, in a 20ft by 15ft square, the trash in the streets included 7 straws, 6 seeds, one lollipop stick, one bottle cap, 2 empty packages of chewing gum, 4 cigarette butts, 2 styrofoam cups, one plastic spoon, three empty water bags, 2 watermelon rinds, 2 eaten ears of corn, and a piece of chewed gum. Dogs circled the local recycling bin, pulling out various food items and dragging them out into the road. The recycling bin present in the two separate time allocations was at both times filled to capacity with various non-recyclable goods. The site of this particular time allocation was covered in flies and located roughly 3 yards away from the market area. These flies landed on sidewalks, vendor food carts, and people. Attempts at counting the quantity of flies present were made. However, traditional methods utilized such as counting flies landing on a piece of paper within a certain time span were unsuccessful and the number of flies in certain areas was too large to count accurately. A rough estimate would place the number of flies present in the squared area over 100 and over 30 in the other observation locations.

Human behaviors interacting with the environment were also observed. Certain factors such as differences in behavior according to gender were unable to be assessed due to the limited amount of females viewed during the time allocations; at one point, there were 25 people in the court area and only one of this group was female (excluding the researcher). There was a wide range of ages always present, and age did not appear to be a factor in who littered. However, children under the age of ten were more likely to touch the refuse in the streets and use discarded objects as toys.

General observations showed that the greatest amount of trash in the streets was located around the market area and on the road headed out of town toward the *Centro de Salud*. Flies were in greatest abundance around the market and at eating establishments. The market area is in the center of town and is bordered by *Cantones Chuacante, Chuasanahí, Pacucha, and Tzanjay*. The restaurants mainly affected by the flies were in general tourist businesses located by both docks. While areas along the shore appeared to have the least amount of trash, it was only slightly less than in other parts of town.

Resident Interviews

All interviewed residents of San Pedro stated that the trash level in the streets was a problem. They also associated the trash with contamination of the lake and poor health, specifically microbiological gastrointestinal vectors associated with contaminated water and used for drinking and preparing food. A small number (n=3) associated the abundance of flies with the spread of disease. However, 50% of those interviewed attributed gastrointestinal problems (infectious or otherwise) mainly to poor diet and hygiene, while 73% rated gastrointestinal problems as the primary health problem for the community.

Table 1 shows how many of the 22 residents representing each neighborhood thought classes on sanitary practices would be helpful for the community. The majority (n=12) stated that classes would not be helpful. They stated that people would either be too busy to attend or the ones who did attend were people who already were health-conscious and already practiced good hygiene skills. Table 2 shows the same responses

but divided by exposure to tourists. None of the residents with no exposure to tourists thought that classes would be helpful. Table 3 shows the preferred solutions by neighborhood to decrease the level of trash in the street and means to improve the health of the community. Those interviewed were asked to suggest what type of solution/intervention they thought would be most beneficial for the health of the town, and in some cases, the respondent thought what would be most useful was not related to gastrointestinal problems or trash (i.e., two respondents suggested a substance abuse rehabilitation center, one respondent suggested education on family planning specifically). While the answers varied and three interviewees did not have any suggestion for a solution, the modal response ($n=7$) was some form of government intervention. Six individuals reported mandatory education as necessary to improve the health practices of individuals. It should be noted that two of the individuals who suggested mandatory education also responded that government intervention would probably also be necessary, for a total of 9 individuals suggesting government intervention. Others interviewed responded that better diet practices were needed, but they were not clear on the best way to improve dietary habits. One of the respondents who thought classes would be helpful did not believe they should be mandatory and instead suggested a substance abuse rehabilitation clinic was needed. Table 4 shows the same solutions based on whether the respondent had contact with tourists or not. Residents who had no contact with tourists favored government intervention, better diet practices, or had no solution ($n=5, 3, 3$; respectively). Individuals who did have contact with tourists also suggested government intervention but the majority encouraged

mandatory education (n=2, 6; respectively). Other responses from this group of respondents included the rehab clinic and family planning education.

Tourists surveyed

Tourists surveyed came from various nationalities including Western European countries and various areas of North and South America. Average age of tourist participants was 31.5 years. All but one participant felt that tourism had some sort of impact on the environment. Two were uncertain to whether or not the impact was positive or negative, though one was leaning toward the negative side. Three could see both positive and negative aspects, which included a benefit to the economy as positive and an increase in waste as negative. One was definitely against tourism due to its effects on the environment since he felt that the increase in waste was not disposed of appropriately and the increase in use of natural resources was not sustainable. Three of the tourists believed that tourism was beneficial because foreign thought brought heightened awareness of environmental health practices. 62% of the tourists surveyed admitted to gastrointestinal problems at some point during their stay in San Pedro (only other illness reported was one case of the flu). The gastrointestinal problems included cases of Giardia, Amebiasis, and upset stomach. All but one attributed their illnesses to either contaminated water/food or the abundance of flies transmitting disease. Table 4 shows the frequency of suggestions that tourists gave to improve conditions in San Pedro. Almost half of tourists who gave a suggestion (n=5) selected mandatory education. Others gave suggestions like setting fly traps or suggestions that would involve some

type of government intervention (i.e. charge taxes). Two tourists surveyed did not think that there was an environmental health problem in the town so suggested more shopping choices to promote tourism.

Free list/Pile sort

Free list responses for the most prevalent illnesses in San Pedro were the basis for the cards used in the pile sort. These responses were: 1) *gastritis*, 2) *parásitos*, 3) *diarrea*, 4) *vomito*, 5) *disentería*, 6) *cólera*, 7) *dolor de cabeza*, 8) *gripe*, 9) *tos*, 10) *fiebre*, and 11) *resfriado* [1) gastritis, 2) parasites, 3) diarrhea, 4) vomiting, 5) dysentery, 6) cholera, 7) headache, 8) flu, 9) cough, 10) fever, and 11) cold]. Twelve individuals (7 residents, 5 tourists) were asked to put these cards in piles according to how the participant perceived the cards to relate to each other. All the residents placed the cards in piles according to the part of the body the illness affects or associated symptoms. For example, one of the respondents had one pile (gastritis, parasites, diarrhea, vomiting, dysentery, and cholera) for stomach ailments and another (headache, flu, cough, fever, and cold) for illnesses that affect the head. However, all the tourists who participated placed the cards in piles according to severity of illness. For example, one tourist had a pile (gastritis, parasites, dysentery, and cholera) of illnesses that required medical treatment and another pile (diarrhea, vomiting, headache, flu, cough, fever, and cold) of problems that did not need treatment.

Centro de Salud

Table 6 shows the top health problems of San Pedro by neighborhood. These data were collected from the San Pedro *Centro de Salud* for the time period of January 1, 2004 to June 30, 2004. Respiratory problems, such as the common cold, flu, and associated symptoms rank as the number one cause for illness for all neighborhoods.

Gastrointestinal illnesses rank second and are at a similar rate amongst each neighborhood, ranging from 26.1 – 29.9% of all infections for the specific neighborhood. The specific gastrointestinal illnesses include Amebiasis, parasites, diarrhea, dysentery, and Giardia. There was no significant difference between neighborhoods and level of gastrointestinal infections as initially hypothesized.

Summary

Similar to the national statistics of Guatemala, gastrointestinal problems rank as the second most common cause of illness in San Pedro and are consistent throughout each neighborhood of the town. Residents interviewed associated contaminated food and water as the primary contributing factor to illness. Food and water contamination were thought to be connected to refuse in the streets that attract flies which spread disease, inadequate hygiene practices, and lack of education. Only residents who worked in the tourist industry suggested that mandatory education was necessary, while others favored government intervention. Tourists as well gave mixed suggestions between education and government intervention. Perceptions of illness varied between residents and tourists.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

A minimal amount of research has been done in San Pedro, Guatemala, specifically regarding the environmental health of the community and, very few studies in general, have looked at community perceptions of sanitation needed to establish culturally appropriate interventions. This study found that the perception of what is an appropriate intervention depends on various factors, such as the influence brought in by the tourist industry. Viewing nature and culture in a human ecological approach is important in understanding how the community views public health concerns such as sanitation in order to minimize mortality due to intestinal infections in the future.

Summary

The purpose of this study was to present the views and concerns of the local population in San Pedro regarding environmental health issues. Specifically, this study analyzed community perceptions of refuse in the streets, to determine what could be done to improve the health of the people in this community. These perceptions were compared

to the perceptions of tourists to assess whether exposure to foreign thought influenced the local population.

This study was conducted from May 15 to July 15, 2004. It included adults aged 16 to 86 who were residents of San Pedro, Guatemala and tourists traveling by themselves or in small groups. Residents interviewed included health and education professionals for background information, while 22 non-professional individuals were interviewed and categorized by the neighborhood in which they resided. A total sample of 35 residents was interviewed, and thirteen tourists were also interviewed. Methods used included interviews, surveys, and time allocations. Morbidity data for San Pedro were also collected from the town's health center.

Conclusion

It was hypothesized that the neighborhood with the most amount of litter in the streets would attract the greatest number of flies. This in turn would lead to the greatest incidence of enteric diseases and the greatest need of classes on sanitation. In contrast, the neighborhood with the least amount of trash in the streets would have the least amount of flies and was hypothesized to have the lowest incidence of enteric diseases and therefore the least in need of classes on sanitation. As noted within the results, there was no significant difference between neighborhoods for neither the incidence level of enteric diseases nor the level of trash in the streets. While research has shown that most flies do not travel beyond a 1-2 miles from their breeding places, they have been found up to 28 miles away (Salvato, 1982), and since there is nothing that prevents them from traveling to the various neighborhoods within San Pedro, flies in one neighborhood is not

necessarily a good indicator for incidence of disease. The flies' ability to traverse from neighborhood to neighborhood may be more of an indicator of why enteric diseases are evenly distributed throughout each neighborhood.

Regardless of the lack of significance in differing incidence rates between neighborhoods, gastrointestinal illnesses continue to be a major health problem within San Pedro as a whole. Most of these illnesses are caused by inadequate environmental health conditions, such as improper waste disposal that attract various vectors of disease, the most obvious being flies. These vector-borne illnesses can easily be prevented with basic precautionary procedures, such as placing trash in a trash bin and hanging flytraps in areas where food is consumed. Every individual interviewed stated that the level of trash in the streets was a problem, and most acknowledged the concomitant problem of flies as a vector of disease, but the response of how to handle these problems varied greatly.

Through the data collected, it was noted that individuals who either worked closely with tourists or were tourists themselves primarily thought the problem was due to a lack of education. However, according to the local population who did not have much contact with tourists, educating the people might not necessarily be the best solution to the problem. Since this group of people did not mention lack of education as being a problem, they instead blamed it on indifference; there was nothing making people act in the way they knew they should, i.e. not discard trash on the streets. Responses indicated most individuals from the community believed something should be done to hold people accountable for their actions and suggested a fine enforced by the police or

by committees established by the mayor. At least one individual from four of the five neighborhoods suggested governmental intervention, in particular in the form of a fine. They believed that unless there was some way to hold people accountable for their actions, there would always be a problem with refuse in the streets.

Discussion and Implications

There is never an easy solution to any health problem, be it environmental, social, or behavioral. As an outsider, it is easy to look at a community, assume that the most obvious problems are of greatest concern, and figure that an intervention that worked in some other community would suffice in that one. However, communities differ in many ways, from resources to perceptions. As noted in the results of the pile sort exercise, the local community perceives illnesses in a different manner than the tourist, or non-native, population. These differences need to be acknowledged by any foreign group attempting to address health concerns within the community. Developing an understanding of what the community perceives to be a problem is the first step in developing an appropriate solution.

There is at times an instinctual response to “educate the people,” in particular for people that have any experience with academia, when attempting to solve a community health problem. And as the tourists interact with the local population, the locals they interact with seem to have adopted the idea that education is always the answer. As well, leaders of NGOs looking to develop public health interventions in the area are usually not native to the community themselves and, like the tourist population interviewed, may have a different perception of what is the problem and what should be done to reduce the

problem. Since most NGOs in the area stress education, it is necessary for public health specialists working alongside these NGOs to recognize that some individuals from the community do not believe that education alone will be beneficial. In order for the health of the community to improve, the views from the community must be taken into consideration when developing an appropriate intervention.

As Mancur Olson in his *Logic of Collective Action* stated, "...unless there is coercion or some other special device to make individuals act in their common interest, rational, self-interested individuals will not act to achieve their common or group interests" (Olson, 1971). As individuals from the community suggested, an intervention in addition to education may be needed to minimize the level of pollution in the community, and therefore reduce the incidence of vector-borne gastrointestinal diseases.

This is the premise of human ecology theory; the connection between behavior and environment requires a deeper understanding of the community in order to develop an appropriate intervention. These are designed best when taking into consideration the relationship between the behavior of the community and its environment.

Recommendations

Since mandatory education was suggested by many but was not considered to be beneficial on its own, an intervention that combines education with other health-promoting practices has more potential for success. While certain government actions may not be easily enforced, simple practices such as setting fly traps in restaurants is a

first step in combating the spread of enteric infection. Further studies can be done with a larger sample population to get a better perspective of what would be most beneficial.

Residents also responded to other public health concerns in the area, namely substance abuse and family planning, and these concerns could be the focus for future study. Other topics of public health concern that arose throughout the course of this study included domestic abuse and mental illness. Since a minimal amount of research has been done in San Pedro regarding the public health of the community, further studies focusing on various public health concerns should be conducted.

As stated in the first chapter, previous research in the Lake Atitlán area focuses primarily on testing for water contamination or looks at the incidence of illness in other towns. However, in order to address these issues, a human ecological approach should be employed to establish a connection between the community and its environment. It is only through community participatory approaches, such as human ecology theory, that a community will be receptive to an outside NGO proposed intervention. It is only through the community's interest that morbidity and mortality due to intestinal infections, or any public health concern for that matter, will be minimized in the future.

Figure 1: Map of San Pedro divided into neighborhoods

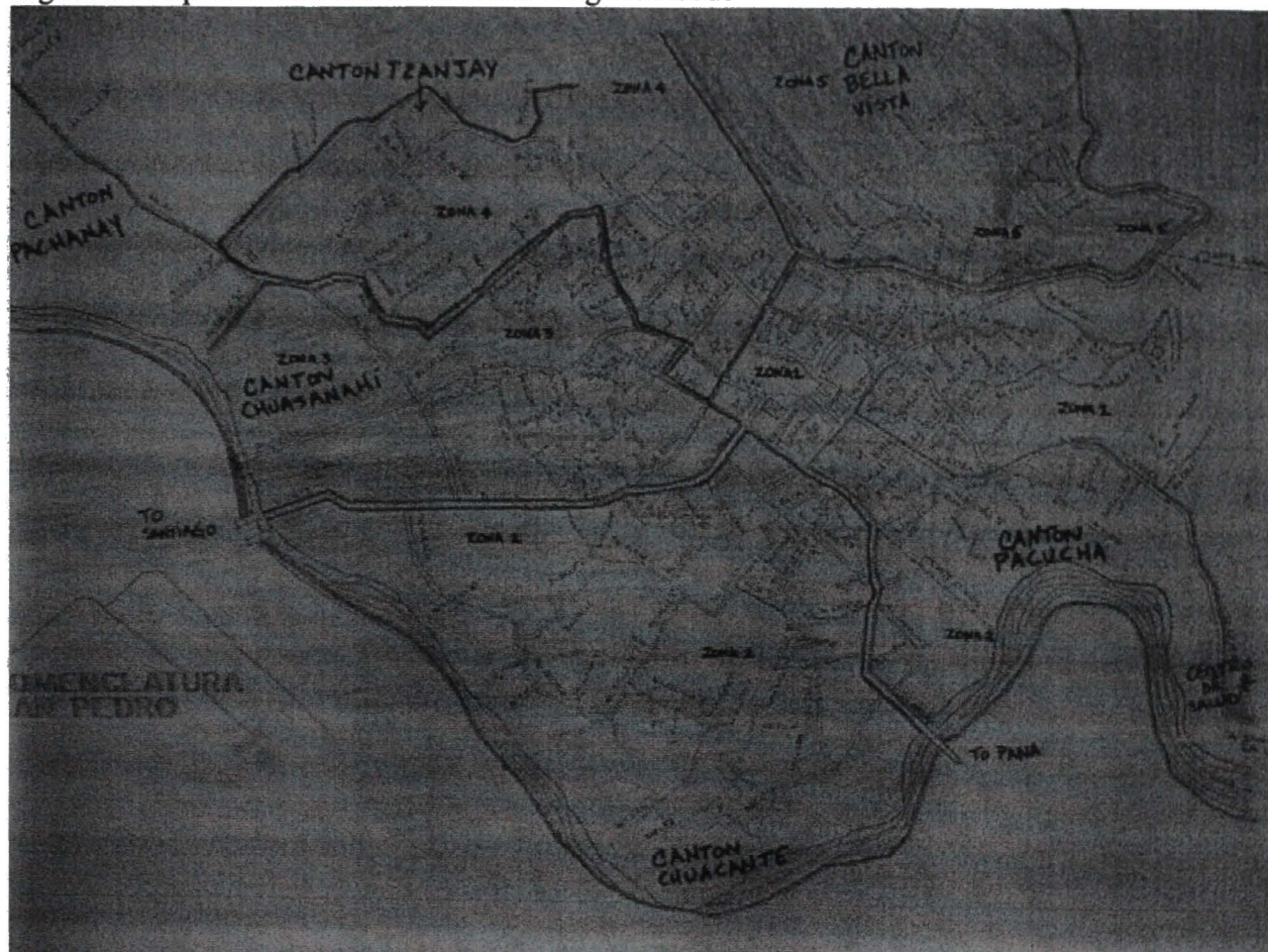


Table 1. Responses to if classes on sanitary practices would be helpful by neighborhood

Neighborhood * Classes would be helpful Crosstabulation

Count		Classes would be helpful			Total
		No	Yes	Maybe	
Neighborhood	Chuacante	2	2	1	5
	Chuasanahi	6	4	1	11
	Pachanay	0	1	0	1
	Pacucha	2	0	1	3
	Tzanjay	2	0	0	2
Total		12	7	3	22

Table 2. Responses to if classes on sanitary practices would be helpful by exposure to tourists

Works in tourist industry * Classes would be helpful Crosstabulation

Count

		Classes would be helpful			Total
		No	Yes	Maybe	
Works in tourist industry	No	11	0	0	11
	Yes	1	7	3	11
	Total	12	7	3	22

Table 3. Proposed solutions from residents by neighborhood

Neighborhood * Solution Crosstabulation

Count

		Solution						Total
		Government	Mandatory Education	Better Diet	Rehab Center	Family Planning	No solution	
Neighborhood	Chuacante	1	2	0	1	1	0	5
	Chuasanahi	4	4	3	0	0	0	11
	Pacucha	1	0	0	0	0	2	3
	Tzanjay	1	0	0	0	0	1	2
	Pachanay	0	0	0	1	0	0	1
Total		7	6	3	2	1	3	22

Table 4. Proposed solutions from residents by exposure to tourists

Works in tourist industry * Solution Crosstabulation

Count		Solution						Total
		Government	Mandatory Education	Better Diet	Rehab Center	Family Planning	No solution	
Works in tourist industry	No	5	0	3	0	0	3	11
	Yes	2	6	0	2	1	0	11
Total		7	6	3	2	1	3	22

Table 5. Tourist suggestions to improve environmental health conditions in San Pedro

Suggestions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no suggestion	2	15.4	15.4	15.4
	mandatory education	5	38.5	38.5	53.8
	charge taxes	1	7.7	7.7	61.5
	set fly traps	1	7.7	7.7	69.2
	better trash pickup	2	15.4	15.4	84.6
	more shopping	2	15.4	15.4	100.0
	Total	13	100.0	100.0	

Table 6. Illnesses by neighborhood

Disease * Neighborhood Crosstabulation

			Neighborhood				Total
			Chuacante	Chuasanihi	Pacucha	Tzanjay	
Disease	Gastrointestinal	Count	92	92	76	78	338
		% within Disease	27.2%	27.2%	22.5%	23.1%	100.0%
		% within Neighborhood	26.1%	28.1%	29.9%	27.7%	27.8%
		% of Total	7.6%	7.6%	6.3%	6.4%	27.8%
	Respiratory	Count	146	137	118	132	533
		% within Disease	27.4%	25.7%	22.1%	24.8%	100.0%
		% within Neighborhood	41.5%	41.9%	46.5%	46.8%	43.9%
		% of Total	12.0%	11.3%	9.7%	10.9%	43.9%
	Skin infections	Count	33	21	14	21	89
		% within Disease	37.1%	23.6%	15.7%	23.6%	100.0%
		% within Neighborhood	9.4%	6.4%	5.5%	7.4%	7.3%
		% of Total	2.7%	1.7%	1.2%	1.7%	7.3%
	Other infections	Count	20	31	18	14	83
		% within Disease	24.1%	37.3%	21.7%	16.9%	100.0%
		% within Neighborhood	5.7%	9.5%	7.1%	5.0%	6.8%
		% of Total	1.6%	2.6%	1.5%	1.2%	6.8%
	Injury	Count	29	24	20	17	90
		% within Disease	32.2%	26.7%	22.2%	18.9%	100.0%
		% within Neighborhood	8.2%	7.3%	7.9%	6.0%	7.4%
		% of Total	2.4%	2.0%	1.6%	1.4%	7.4%
	Other	Count	32	22	8	20	82
		% within Disease	39.0%	26.8%	9.8%	24.4%	100.0%
		% within Neighborhood	9.1%	6.7%	3.1%	7.1%	6.7%
		% of Total	2.6%	1.8%	.7%	1.6%	6.7%
Total	Count		352	327	254	282	1215
	% within Disease		29.0%	26.9%	20.9%	23.2%	100.0%
	% within Neighborhood		100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total		29.0%	26.9%	20.9%	23.2%	100.0%

APPENDIX A

INTERVIEW QUESTIONS

APPENDIX A

Interview Questions

- 1) Please list the main illnesses found here in town. (This was used as part of a free list technique to establish a pile sort. The first seven individuals' answers were used for the pile sort.)
- 2) What do you think are the causes for these illnesses?
- 3) What percentage of the population do you believe visits a curandero or uses natural medicine, instead of seeing a medical doctor?
- 4) How would you describe the environment?
- 5) What would you suggest to improve the state of the environment and the health of the community?
- 6) If classes were offered at a convenient location and time, which focused on maintaining health and the environment, do you think people would be willing to go? Why or why not?
- 7) Profession/Education/Age/Neighborhood

APPENDIX B

TOURIST SURVEY

APPENDIX B

TOURIST SURVEY

APPENDIX B

Tourist Survey

- 1) Why did you come to San Pedro?
- 2) How long have you been here?
- 3) How much of the town have you visited?
- 4) How would you describe San Pedro?
- 5) What do you like most and what do you like least about San Pedro?
- 6) Have you been sick since you have been here? If so, what kind of illness?
And what do you attribute to the cause of the illness? What did you do to
make yourself better?
- 7) What have you noticed about the sanitary practices around the parts of town
you have been in?
- 8) What is your general impression of the physical environment of San Pedro?
- 9) How do you think tourism affects the physical environment of San Pedro?
- 10) What suggestions would you make to improve the state of the physical
environment of San Pedro?
- 11) What groups/organizations/initiatives do you know of that are working toward
improving the physical environment specifically in San Pedro?
- 12) Profession/education/nationality/age/sex

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