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SHIFTING LOCAL ECOLOGIES:
Biocultural Interactions and Ecuadorian Public Health

by

Sabrina Nicole Bradford

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of
the requirements of the Sally McDonnell Barksdale Honors College.

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ABSTRACT

Though biology is considered universal, this thesis argues against the assumption of the universal applications of biomedicine in favor of a biocultural approach, emphasizing shifting local ecologies in an increasingly globalized world. This research investigated Ecuadorian health within an ecological context in coordination with an international public health internship that was completed through the Universidad San Francisco de Quito and the Ecuadorian Ministerio de Salud Pública. Throughout this thesis, examples are provided demonstrating that globalization, though appearing as a homogenous process on the international level, creates heterogeneous effects on the local scale. To explain the mechanisms and implications of these heterogeneous effects, I conceptualize health relativities and local ecologies. The term health relativities I define as the different cultural norms for defining health and illness. Local ecologies I conceptualize as a community level contextualization of biocultural interactions.

The choice of Ecuador as a research location provided the opportunity to observe different health relativities in relation to local ecologies. In other words, the differing local ecologies produced certain health relativities. Ecuador's high ethnic diversity also provided examples of how different groups may be impacted in relation to shifting local ecologies. Global processes today, ranging from the globalization of Western dietary practices to foreign-driven resource extraction and global climate disruption, require an in-depth understanding of how biocultural interactions occur on a local level within the context of the global processes. It is only through thick description that many variables may be extracted that would otherwise be ignored by statistical analysis. In addition, the evidence presented by this thesis demonstrates the inadequacy of a global solution to global problems. Though global processes may be the catalyst, differing local ecologies create the necessity for contextually based solutions.

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Introduction

The purpose of this thesis is to address the importance of understanding local ecologies and biocultural interactions within a global world while challenging the assumption that biology is universal. The themes I will focus on include biocultural interactions, the transformation of local ecologies, governmentality and ethnomedicine. Furthermore, I will discuss the interplay between these different themes in connection with globalization and the transformation of health.

I conceptualize the themes of “health relativities” and “local ecologies” in this thesis to provide an explanation of why thick descriptions matter in the case of health and how biocultural interactions may be subject to global processes on a local level. By health relativities, I mean that similar to the way each culture is viewed within its own context through cultural relativism, the classification of disease is also a contextual phenomenon. For example what may be considered to be a sickness in one culture may not be in another. Similarly, different words other than those recognized through biomedicine might be used to describe one particular disease (Nations, 1986, p. 113) These health relativities may be viewed as the result of differing “local ecologies” which is a community scale contextualization of biocultural interaction in contrast to Gaines’s (1987) individual-scale “local biologies” conceptualization. While the local biologies definition focuses on individual biological differences, the local ecologies conceptualization recognizes the impact of biocultural interactions on a community level. To demonstrate the impact of health relativities and relevance of local ecologies, I present case analysis from different geographical regions of Ecuador.

In challenging the universal applications of biomedicine, I chose to examine the biocultural interactions in relation to public health. My interest in Ecuadorian biocultural interactions and health stemmed from my own experience of contracting dengue fever during the summer of 2010. I became symptomatic as I returned to the United States and the “health relativities” present were made painfully obvious. Ecuadorian doctors were able to diagnose me far more rapidly than the infectious disease specialists in the United States. The difference can be attributed to the familiarity the Ecuadorian doctors had with the geographical location I was in as well as the known biocultural interactions of those areas. Dengue fever is indicative of negative biocultural interactions and knowing the disease itself is suggestive of the environment of the area. Dengue fever is not endemic to Ecuador; it is believed to have arrived during World War II. In addition, dengue fever is vectored by the *Aedes aegypti* mosquito. In contrast to the dawn-and-dusk biting *Anopheles* mosquito (the vector of malaria), the *Aedes aegypti* mosquito bites during the daytime. Dengue fever is known to exist in periurban areas and shantytowns or, in my case, frontier towns of the Amazon. My own personal experience allowed me to begin to recognize that local ecologies are bound to biocultural interactions and health relativities develop as a result of the interactions.

Methods

I returned to Ecuador in January 2011 to pursue my thesis research project and investigate health relativities in the context of biocultural interactions. The project was conducted in Ecuador, with literature review conducted out of Quito, while fieldwork took place in the Pacific montane forests, Andean highlands, and the Ecuadorian Amazon. International Review Board (IRB) approval was given for the project and the

methods employed included observation and interviews with local and regional public health officials in addition to the Cofán and Kichwa ethnic groups. Oral consent was provided and the study took place at the same time as a 4-country malaria survey (Colombia, Peru, Venezuela, and Ecuador) conducted by Dr. Fernando Ortega, which was supported by the Bill and Melinda Gates Foundation to create a baseline for a comparative analysis of Andean health systems. Interviews were conducted in a community discussion based setting rather than a one on one interview and open ended questions were asked in addition to specificities on local public health services. While the government's greatest problems were related to insufficient human and material resources, the study was able to determine that the environmental degradation of the local environments posed the greatest threat to human health. It is for this reason I chose to investigate both the types of environmental degradation and contributing factors.

In order to demonstrate the various biocultural interactions throughout the regions of my field studies, each chapter has been dedicated to a particular region and corresponding health relativities. Chapter I focuses on the Andean region which includes the Pichincha, Cotopaxi and Tungurahua provinces with a focus on nutrition and highland industry. In Chapter II, the Costa field study includes the provinces of Esmeraldas and Santo Domingo with a focus on medical pluralism, urbanization, and social capital. The Oriente, or Amazon, region of Ecuador is the focus of Chapter III and evaluates the shifting biocultural interactions as a result of the oil industry and focuses on themes of governmentality and the relationship between ethnocide and ecocide for the people of the Succumbios, Napo, Orellana and Pastaza provinces.

Literature Review

Before analyzing health relativities in relation to biocultural interactions, it is necessary to understand the definitions of disease, illness, and sickness as is used in this paper. I have chosen to use these terms as defined by McElroy and Townsend (1996). Disease is defined from the perspective of biomedical science as a deviation from clinical norms, an organic pathology or abnormality. Disease, in contrast to illness, is understood from the perspective of the doctor while illness is understood from the perspective of the patient. Illness is the sufferer's interpretation of his or her experience including beliefs of causality which are frequently provided by the culture to explain the sickness. Sickness is understood as a social category and includes societal norms for how a sick person is expected to behave (McElroy & Townsend, 1996, p. 44). A simple example of the interplay between these three definitions would be that of a child faking sick to get out of school. While the child may not experience any illness, his behavior may suggest that he is sick, only to be later told by a doctor that he in fact has no disease based upon clinical standards.

Biomedicine and Local Biologies

Biomedicine, also known as Western medicine, was first developed in Europe during the 18th century. The tradition of biomedicine understands disease as the result of a unique biological cause within the body with each disease having universally recognized symptoms (Wiley & Allen, 2013, p. 10). The rise of the usage of the scientific method has grown out of an ever increasing understanding of microbiological processes. However, the nature of data production relies upon the ability to have reproducible results. For example, Koch's postulates rocked the world of microbiological research by providing a way to identify a causal relationship between a

pathogen and disease in a system (Evans, 1976). This method of gathering data, while useful at generating general assumptions, has led to the assumption that because biology is universal, bodies everywhere must be the same (Lock & Nguyen, 2010, p. 108).

Several researchers, however, recognized this not to be entirely true. Lock and Nguyen (2010) argue that biology itself is only a snapshot, temporally situated and affected by politics, culture, economics and history. Furthermore, Lock and Nguyen note that it would be incorrect to assume that there is a universal biological body that is affected and shaped by external socio-cultural factors. The body itself has been shown to not be universal in that micro-organisms are transformed by human activity and may cause different symptoms dependent upon the “kinds” of bodies they invade (Lock & Nguyen, 2010). These different kinds of bodies are manifestations of different genetic, historical, socioeconomic and cultural backgrounds. A chronically stressed body behaves differently than one that is not, in the same way that a body infected with HIV behaves differently than one that is not.

Gaines (1987) conceptualized these different “kinds” of bodies as “local biologies” in contrast to the previously understood “local biology”. The importance of the pluralistic nature of “local biologies” reflects the rejection of understanding biology as universal. That is, the term local biology in singular refers to the Western tradition of understanding biology as universal. In contrast, the transition to the pluralistic “biologies” is a more accurate depiction, reflecting that while fundamentals of human biology may appear to be universal, the mechanisms of regulation and function may vary (Lock & Kaufert, 2001; Lock, 1993). These bodies are affected by biocultural interactions producing unique local biologies.

These biocultural interactions may result from cultural adaptations for survival. The concept of adaptation was first applied to medical anthropology theory by Alexander Alland, Jr., who used the mathematical term “minimax” to describe practices that minimized the risk of disease to a group while maximizing the benefits (Alland, 1970). An example of this would be the use of “night soil” for fertilizer by sustenance farmers. While the farmers view this as an adaptive response to poor soil, from the biomedical perspective night soil poses health risks to those that handle and work in the fields as night soil contains human feces, often laden with the eggs and cysts of parasites. To reduce this risk, night soil is stored for several days so that the resulting combustion may reduce the number of eggs. The minimax model demonstrates human and the environment interplay, but the model would never have a permanent solution for a particular area or culture as a result of the dynamic nature of biocultural interactions that are constantly changing (Alland Jr, 1970). These adaptations are continuously changing in response to biological, cultural and historical factors and are not always beneficial to the population. The example of agricultural adaptations leading to increased malaria prevalence is an example of a maladaptive cultural strategy in relation to disease.

Local Biologies: Malaria and Agriculture

The phenomena of biocultural interactions resulting in unique local biologies is especially observable in the case of the development of malaria in sub-Saharan Africa. Malaria is one of the most ancient parasitic diseases that may afflict the human population; however, as a result, populations living in endemically malarial environments have evolved genetic characteristics that contribute to malaria resistance. These characteristics include variants of hemoglobin, some of which are rare or localized such as hemoglobin E in Southeast Asia and hemoglobin C in West Africa. A more

widespread variant is hemoglobin S (HbS), which has proved advantageous in the context of certain local biologies (Wiley & Allen, 2013).

Malaria is caused by a protozoan of the genus *Plasmodium* and is a parasite which lives in red blood cells. The protozoan cannot survive outside of their host and continue to grow until rupturing the cell, releasing waste products and pigment that brings on chills, headaches and fever-in some populations. It would not be possible to understand the biocultural interactions and prevalence of malaria without an understanding of the particular vectors of this disease. While the less severe forms of the protozoan (*P. vivax*, *P. malariae*, and *P. ovale*) have a longer evolutionary history with humans, the most severe *P. falciparum*, accounts for 50% of acute symptoms, with a 25% mortality rate for the nonimmune. The vector of *Plasmodium falciparum* is the mosquito genus *Anopheles*. There are two major groups of *Anopheles* mosquitoes in sub-Saharan Africa: *Anopheles gambiae* and *Anopheles funestus*. The two species inhabit two distinct ecological niches. *Funestus* mosquitoes breed along shaded river edges and in swamps in undisturbed forests while *Gambiae* mosquitoes breed best in open, sunny pools and in ditches with slow running water. Before the introduction of agriculture into sub-Saharan Africa 2000 years ago, African forest dwellers lived as hunters with a semi-nomadic existence. As a result there were relatively few breeding areas for *Gambiae* mosquitoes. *Funestus* mosquitoes fed on other mammals and rarely on humans, resulting in a low incidence of malaria (Packard, 2011).

The introduction of agriculture 2000 years ago changed the ecology of the tropical forests in sub-Saharan Africa. The introduction of iron tools increased the rate of forest clearing to make room for root and tree crops. This created ample habitats for *gambiae*

mosquitoes. The shift in settlement patterns and decrease in mammalian hosts left humans as the primary food source for the gambiae mosquito. It is believed that during this period *P. falciparum* began to adapt to human blood cells. The introduction of agriculture led to high mortality rates from mosquitoes and quickly selected for the sickle cell trait for abnormal hemoglobin, which provides resistance to malaria. It is estimated that 40% of the population of West Africa carry this gene (Wiley & Allen, 2013).

The abnormal hemoglobin, hemoglobin S (HbS), is the result of a point mutation at the sixth position that resulted in the sequencing of the amino acid valine, as opposed to glutamic acid which is found in normal hemoglobin. Glutamic acid has a negative charge, allowing hemoglobin molecules to easily change from high to low oxygen affinity. Hemoglobin containing valine, in contrast, has no electrical charge and tends to clump together. Although the abnormal hemoglobin differs from normal by one amino acid, this difference allows HbS to effectively inhibit the lifecycle of the plasmodium parasite. The red blood cell with HbS further sickles when infected by the plasmodium parasite and is then removed and destroyed by the spleen (Wiley & Allen, 2013).

The HbS mutation did not arise only in Sub-Saharan Africa. There is evidence that the sickle cell mutation arose and was dispersed three times in Africa, once in India and once in Saudi Arabia (Wiley & Allen, 2013, p. 99). The sickle cell gene is an example of a trait that provides a heterozygous advantage. While those heterozygous for the HbS mutation are resistant to malaria, those homozygous for HbS develop sickle cell anemia, a disease that is usually fatal for children. The HbS trait is a mutation that was selected for due to the advantages it provided in the context of a malarial environment. In the absence of this environment, the HbS trait provides no advantage. The prevalence

of those inheriting the trait has seen a rapid decline amongst the African American community in the United States from 20% in the mid-twentieth century to only 5% in 2008(National Institutes of Health 2008). The example of the HbS mutation demonstrates the importance of understanding the different kinds of bodies and the relevance of understanding biocultural interactions. A body heterozygous for the HbS trait, a body homozygous for the HbS trait, and a body without the trait are all still the same human body but each functions differently in the context of a malarial environment.

Evaluating the Body Contextually

Sociologist Steven Epstein (Epstein, 2007, p. 135) recognized the importance of evaluating the human body contextually and determined a method of standardizing these contexts through what he called niche standardization. For example, serum hemoglobin levels for humans are considered to normally oscillate between 120 and 150 milligrams per liter of whole blood. A clinician would recontextualize this information when examining a vegetarian patient. Through Epstein's niche standardization principle, vegetarians themselves would make up a subpopulation whose standardized "normal" hemoglobin levels would be lower than what was "normal" for the general population. Effectively, niche standardization would allow clinicians to discount otherwise questionable medical findings in the member of a subpopulation as being the norm.

Lock and Nguyen rejected Epstein's niche standardization principle. While this principle recognized that the human body was contextually situated, they believed that statistical operations could only describe the "thin" variables without capturing the "thick" social dimensions of the production of biological difference. To capture the "thick" social dimensions requires a "thick description." Thick description, as described

by Clifford Geertz (1973), aims to describe not only the behavior of a culture, but the context as well, so that even an outsider may understand it. A thick description of health would describe not only the disease, but the context of the disease to best understand the ultimate cause, which may not necessarily be biological in nature. Thick description would not only capture the thin dimensions, but would incorporate factors such as the sociocultural, economic and ecological influences on an individual or group of people.

One of the most notable differences between the biomedical and biocultural approach to health is that the biomedical analysis of disease ends at determining the locus of disease, biocultural analysis begins (Wiley & Allen, 2013). As Wiley and Allen (2013) noted, this difference is in understanding the proximate and ultimate causes of disease. In this context, proximate is understood as the most immediate cause of physiological disruption whereas determining the ultimate cause is more distant. In other words, a series of lab tests may identify the disease by name but biocultural analysis seeks to understand the more distant cause, the underlying factors that lead to disease. Ultimate factors, as understood through biocultural analysis, may include agents of disease not recognized by biomedicine including witchcraft, sorcery or divine intervention (Wiley & Allen, 2013, p. 21).

Local Biologies and Local Ecologies

These thick dimensions may be understood as the result of biocultural interactions which on an individual scale may affect the local biologies of separate individuals; however, biocultural interactions also occur on a larger scale. Similar to the way the concept of local biologies frames the individuals of a population within the context of the self, the conceptualization of local ecologies provides a framework through which to

better understand the way an entire population might be affected by macro-scale global influences. For the purpose of this paper, research in biocultural interactions may be defined as research that focuses understanding on human biology and medical ecology in the context of social, cultural, or behavioral factors (McElroy, 1990, p. 243). The biocultural model requires that cultural data be systematically collected with biological and environmental data. Researchers trained in what McElroy (1990) termed “conventional” human biology have noted the importance of understanding the biocultural paradigm when conducting field studies in areas where they are frequently isolated, relying on working through an interpreter or in a foreign language, in locations where public health records are frequently nonexistent or inaccurate and collecting health histories from people who define health and illness differently than what the researchers were “conventionally” trained to recognize. These types of research projects present a challenge to practitioners who must assume an understanding of the differences in culture and its intrinsic link to the understanding of the health in a population.

Intensive research in the subject originated in the 1960s when the field of adapted human biology shifted its focus towards understanding the interactions between culture and population health (McElroy, 1990, p. 245). The methods for conducting biocultural research were developed through 200 research projects sponsored by the Human Adaptability Project of the 1960s (Little et al., 1984). These projects were carried out among what were defined as isolated populations and people were studied as groups rather than as individuals to better understand what types of adaptive strategies a culture might have devised as a reaction to environmental stressors (Wellin, 1978, p. 34). The

method used is reflective of anthropological theory of the time which had not yet begun to embrace globalization or global phenomena and the related impacts on populations.

Though the environment plays an important role in culture and health, the biocultural paradigm is distinct from the environmental determinism approach. Under the environmental determinism paradigm, the culture of any population is a passive figure, determined by the external environmental factors. In contrast, the biocultural paradigm evaluates the human-environmental interactions as an active process. Culture may be influenced by the environment, but culture may completely change the environment. As was noted in the malaria example, the introduction of agriculture 2000 years ago created optimal conditions for the transmission of malaria. Culture is not passive to environmental factors but actively interacts with and in many cases changes the environment. For this same reason the socioecological modeling system was not used in this thesis due to its environmental deterministic tendency and its lack of utility to understand global scale processes (Kappeler, et al., 2003, pp. 1-2).

Global Health: Addressing Medical Pluralism, Ethnomedicine, and Governmentality

The question of how to address the body is not only one which faces clinicians. Worldwide, the surge of the age of biomedicine and microbiology has led to talk of “global health” replacing the original “international health” (Lock & Nguyen, 2010), recognizing that microbes do not abide by political borders and are a ubiquitous problem for populations across the globe. Once again, the understanding of biology as universal must be recognized as a false assumption. The “global health” paradigm itself is believed to have evolved out of the worldwide diffusion of biomedicine that was so important during the colonial era (Lock & Nguyen, 2010, p. 156). The perception of global

biomedicine today is driven by advocates of the efficacy of germ theory. International institutions, global industries, and non-governmental organizations (NGOs) all favor this theory that provides a standard and easily marketable solution to global health disparities. For international institutions, finding a solution that works most of the time for most of the population is more financially feasible than determining multiple solutions that work well for all parts of a population. Although these technologies are extremely powerful and have in many cases transformed societies, it is important to note that one size does not fit all when dealing with local ecologies as studies have shown (Worthman & Kohrt, 2005; Hawkes, 2006; Eisenberg, et al., 2006; McCelroy & Townsend, 2008; McElroy, 1990).

A lack of understanding in local ecologies is damaging to both the clinician and the patient when attempting any intervention. Differences in local ecologies become visible through the failure of health interventions as a population health problem. When Europeans utilized early colonial biomedical technologies to aspirate cerebrospinal fluids or lymph fluids from the necks of native populations, local interpretations led to the belief that Europeans were vampires. In a more recent example, Western attempts at preventing the spread of HIV through condoms and anti-retroviral medications have led to mistrust in many populations in developing countries. The use of condoms, while providing some protection against HIV and unwanted pregnancies, also can be interpreted as a lack of trust in a partner or taken as evidence of infidelity (Lock & Nguyen, 2010). In addition, anti-retroviral medications are effective in reducing the quantity of HIV in the blood through blocking replication, but can also result in rare fatal toxicities- leading to rumors that they are actually poisons. Although, a malnourished

population has a statistically higher chance of having potentially fatal toxicities from anti-retrovirals, different individuals metabolize the drugs differently (Lock & Nguyen, 2010, p. 157). International efforts against HIV/AIDS also illustrate the impact of governmentality on health. By governmentality I am referring to the ability of the government to control who receives treatment and how (Foucault, 2010). This can be understood through the way government may address a problem in the population or who is able to receive treatment, shaping health relativities. This type of governmentality may make treatment available to a certain gender, race, socioeconomic status or geographical area (Susser, 2009). This example illustrates the complexities of the entanglement between local ecologies, governmentality and the contextual situation of the body.

Another source of distrust towards biomedicine is the displacement of ethnomedicine, also known as traditional or folk medicine. Advocates of biomedicine may intentionally or unintentionally suggest that ethnomedicine is wrong, foolish and ineffective in comparison to the clinical effectiveness of biomedical treatments. Many cultures however, do not completely reject biomedicine or completely abandon ethnomedicine and instead utilize multiple healing systems, also known as medical pluralism (Lock & Kaufert, 2001). In most state-level societies, multiple healing traditions are rooted in historical exchanges with other societies whether it is from trade, migration, imperialism and most recently, globalization. It would be wrong to assume that traditional healers such as shamans would discourage the use of biomedicine. I have witnessed several shamans that after evaluating their patient would encourage the patient to seek biomedical treatment if they believed the disease was resulting from maladies such as kidney stones or cancer. While the cost of seeking treatment through

ethnomedicine is cheaper, many patients may also consider ethnomedicine due to the fact that it treats disease such as *mal ojo* or *susto* that are not even recognized by biomedicine. Additionally, a patient being treated for a disease biomedically may seek ethnomedicine as a complement or vice versa as a pluralistic health system. These treatments frequently include medicinal plants, utilizing the local ecology to effectively alter the local biologies. One complication that occurs with medical pluralism is the usage of different terms to describe illness and disease. For example, in a study conducted in Pacatuba, Brazil examining the cause of childhood deaths, epidemiologists identified 11 causes of death in contrast to the ethnomedicine diagnosed 24 different causes. One example in the study was that of diarrheal/dehydration which is illustrated in the following table, which was created through utilizing the data set provided by Marilyn K. Nations' comparative analysis between diagnostic methods between ethnomedicine and biomedicine to illustrate epidemiology's weakness in overlooking the deep components of patients' lives in favor of statistical rigor (Nations, 1986, p. 113).

Biomedical	Ethnomedical																		
<i>Most probable cause of death as determined by physician/epidemiologist (n=46)</i>	<i>Cause of death elicited by family by medical anthropologist (n=62)</i>																		
Diarrhea/Dehydration 32 deaths	<table> <tr> <td>Fright (susto)</td><td>18 deaths</td></tr> <tr> <td>Evil eye (mal ojo)</td><td>8 deaths</td></tr> <tr> <td>Illness of the child</td><td>8 deaths</td></tr> <tr> <td>Swollen belly</td><td>2 deaths</td></tr> <tr> <td>Wind in umbilical cord/Cord didn't fall off</td><td>1 death</td></tr> <tr> <td>Weakness from cold vapor rising from floor</td><td>1 death</td></tr> <tr> <td>Born sick</td><td>1 death</td></tr> <tr> <td>Contaminated milk</td><td>1 death</td></tr> <tr> <td>Worms</td><td>1 death</td></tr> </table>	Fright (susto)	18 deaths	Evil eye (mal ojo)	8 deaths	Illness of the child	8 deaths	Swollen belly	2 deaths	Wind in umbilical cord/Cord didn't fall off	1 death	Weakness from cold vapor rising from floor	1 death	Born sick	1 death	Contaminated milk	1 death	Worms	1 death
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Contaminated milk	1 death																		
Worms	1 death																		

Another example of the importance of recognizing the influence of local ecologies on local biologies as a result of biocultural interactions is the case of *kuru* in Papua New Guinea. Kuru was described as a particular disease in highland Papua New Guinea that began with tremors with symptoms eventually presenting a complete collapse of the nervous system. Although biomedicine attempted to explain kuru as the result of genetic mutation, cultural anthropologists Robert Glasse and Shirley Lindenbalm were able to uncover the true source of the disease. Through their research they determined that both cannibalism and kuru were relatively new to the local population, starting in 1910 with cases of kuru occurring later. The disease appeared to be linked to cannibalism with disease rates falling as cannibalism fell and vice versa. Research in this biocultural interaction revealed the source of kuru as a prion caused disease, similar to Mad Cow Disease (McCelroy & Townsend, 2008). In this way, one can see how the local biologies of individuals were further shaped by the local ecologies of societal traditions and beliefs.

These examples of local ecologies in a global context reflect upon the importance of understanding the interactions between the micro and macro scale of human organizational variables, in addition to understanding the body itself as contextually situated. Understanding the body as contextually situated is the attributing of biological variations to temporal processes rather than statistical probabilities (Lock & Nguyen, 2010, p. 108). The conceptualization of local ecologies has been the anthropological response to Epstein's niche standardization concept and incorporates the concept of local biologies as well. My thesis argues against utilizing a niche standardization model in

favor of a model that includes the complex biocultural dimensions that cannot be represented through statistical data.

Ethnomedical influences, which cannot be understood through statistical analysis, are nevertheless highly important. Without understanding how the community regards a sickness, or if the illness is even recognized by the community as a sickness, sustainable health intervention strategies would be nearly impossible. In the past, each culture has worked within its own historical health experience to determine its own health relativities. The cultural understanding of these health relativities allows a community to distinguish between serious illnesses and those that are regarded to be normal. In the case of the Ogori tribes, curers are not expected to intervene in cases of malaria, hepatitis, or yellow fever (Gillies, 1976). In the same way, the Zulu consider the common cold, seasonal diarrhea, measles and smallpox to be natural illnesses that do not require the consultation of local healers (Ngubane, 1976). Egyptian boys in the Nile Delta commonly excrete blood-stained urine due to infestation with a pathogenic blood fluke, *Shistosoma mansoni*, but the endemic population recognizes this as normal; a boy with unstained urine would be anomaly in this community. The previous example demonstrates the interactions between local ecologies and health relativity. The human-environmental interactions of the area have allowed the endemic community to observe symptoms of schistosomiasis that have resulted from the local ecology, as a health relativity. While any biomedically trained scientist would say that the boys with blood stained urine were diseased, it is unlikely that the statistic would ever surface on a larger scale. Since the blood-stained urine is normal, there would be no reason to consult a

health clinic. Thus, the disease would continue to exist but no sickness would be perceived by the endemic population (Nations, 1986, p. 105).

Local Ecologies and Governmentality

The role of biocultural interactions as is illustrated through local ecologies cannot be understated in its influence on the definition of health in an area. In addition, it has been noted that population genetics play only a small role in this variation, which further demonstrates the impact of local environmental conditions on development. This difference in local biologies, that is the self interacting with the environment, is part of the local ecology whole. Understanding the differences in local ecologies will play a key role in addressing the limitations in universal health intervention such as the success of vaccination programs (Worthman & Kohrt, 2005).

The original development of biocultural methodologies was the result of some 200 research projects, all of which were carried out amongst “isolated populations” to better understand their local ecologies (McElroy, 1990). The idea of an “isolated population” itself is indicative of the fact that the concept of nature is a cultural construct. Viewing a population as isolated would be an ethnocentric approach and ignores the existence of “outside” influences such as may occur through trade, migration, war or global environmental processes.

I argue that it is necessary to evaluate populations’ local ecologies within a global context. The local ecology of each population is subject to the influences of global processes that include both biological and cultural components. For example, international trade and business has allowed Coca-Cola to find its way into some of the

most geographically isolated regions of the globe, international politics may drive certain policies such as was the case in the imperial morality and Africa, and global climate change is challenging populations worldwide to adapt to altered environments. In addition environmental degradation has been driven by global and local processes with local and global consequences. To combat the challenges of addressing biocultural interactions in the frame of local ecologies requires an assessment of not only the population's interaction with the immediate environment but the population's direct and indirect interactions with these global processes.

Internship

The Integrated Community Development Department (ICDD) is part of the College of Health Sciences Universidad San Francisco de Quito in Ecuador. During the spring of 2011 I participated in an International Public Health Internship in this department and was able to participate first hand in the working of the university in the field and in the classroom as well as from the local to global level.

With 50 ecosystems and 27 different ethnic groups, Ecuador's megadiverse setting allows one to observe not only a myriad of environmental or socioeconomic problems but has also provided a grisly illustration of the effects of unchecked globalization and the inequalities that frequently accompany development. Shrimp farms displacing mangroves and the indigenous groups that subsist off of them, paths that not only transport oil, but disease, and childhood malnutrition rates that surpass 50% in many cantons of the country. My fieldwork took place in the Costa (Coast), Sierra (Andean Highland), and Oriente (Amazon). On the coast I worked in the slums of a city called Santo Domingo, compiling and analyzing surveys relevant to the population's STD knowledge. In the Sierra, I researched the health effects of Tungurahua volcano on communities and in the Oriente I assisted with gathering information about malaria interventions from different focus groups and area public health officials. The geographical regions are designated by the following map (Schweitzer, 2011).



Background of the Organization

The ICDD is a national program that incorporates students' training and research with particular community level projects. Also, international cooperation plays a distinct role in the ICDD by offering researchers and students from 17 North American universities and 9 European universities. The students come from countries such as Germany, Spain, Canada, the United States, and the United Kingdom for internships at rural clinics, hospitals, and the opportunity to conduct specialized research in contaminants such as lead and mercury. Ecuadorian students that attend the USFQ public

health school are also required to take courses through the department as part of the degree curriculum.

The “integrated” factor in this department is not only working directly in the communities but the ICDD workers themselves are not specifically health workers. When I asked my supervisor, the director of the department, who was targeted, he replied, “we have veterinarians, journalists, biologists, entomologists, and so many other professions coming in-the solutions that these problems require will need workers from all fields, not just public health...What we want to do is give them an opportunity to see and understand what people are facing here-even if they do not come back to Ecuador our hopes is that they will use the skills they learn here to make informed decisions” (Ortega, 2011).

The department aims to identify public health problems and create solutions with an understanding of the biocultural interactions of health in communities. Most importantly the department seeks to always work actively with members of the local communities, believing that community involvement is key to sustainable outcomes. The development model the department follows involves listening to the community’s most pressing needs, forming an assembly between the community and groups that could offer solutions (researchers, NGOs, other communities), and lastly creating a six step community action plan.

Internship Description

While the ICDD frequently offers MPH and PhD students both from USFQ and abroad research opportunities, my path to this internship was as non-traditional as the

internship itself. I originally established contact with my supervisor, Dr. Fernando Ortega, during August 2010 when I was diagnosed with one of the more severe tropical diseases that exist in Ecuador. Several months later, when I contacted a former professor to inquire about public health classes at USFQ my email was forwarded to Dr. Ortega. Surprised that I would even consider returning to the country after such an ordeal, I was offered an international public health internship. My duties were loosely defined to be working as a research assistant in the university, working with the ICDD with various communities in Ecuador, and assisting with several different classes. Without my previous experience in Ecuador during the summer of 2010 when I had attended USFQ as a student for several months, I might have questioned whether my loosely defined requirements would give me enough work to do; but, as a developing nation, Ecuador runs on a different schedule.

After completing the internship within a university setting, I can now appreciate the tool that such a setting provides for collaboration between different academic fields. While those working in the ICDD department included medical doctors, public health specialists, anthropologists, and sociologists; we found ourselves in meetings with entomologists discussing vectored diseases, geologists to talk about the composition of volcanic ash, botanists to inquire about plants' ability to bio-accumulate toxic chemicals, and conservation biologists to inquire about environmental degradation they had recorded in the Oriente. The collaborative environment of the university was an educational experience in itself by observing how the various departments worked together towards understanding the source of health disparities in Ecuador and proposing feasible solutions. Other than attending numerous meetings, I completed research into the

backgrounds of the communities that we would be working with, determining the source of the health problems and the factors that would both inhibit and promote development. This literature review prompted meetings with specialists who advised us to even more literature. This cycle proved both efficient and effective in forming a solid foundation for work with the communities.

With middle-class virtually non-existent, Ecuador is a land of extreme wealth and astounding poverty. In Ecuador, one can see the heterogeneous local effects of seemingly homogeneous globalization processes, and look in the daily newspaper to see the effects of environmental degradation upon health. By homogenous globalization processes, I am referring to the expansion of certain industries such as the fast food industry which offer essentially the same Kentucky Fried Chicken or Dunkin Donuts everywhere. Similarly, urban sprawl may also provide an example of a homogenous globalization process, but with very distinct local differences.

The internship I completed in Ecuador was the most educational experience of my life because it challenged me to confront difficult problems on a personal basis and fully understand the necessity for commitment on the community level in scientific inquiry. My brief stint in the university-field setting allowed me to better grasp not only what is happening around the world in developing countries, but why, and provided me a deep understanding of the necessity of medical anthropology in understanding health and constructing public health interventions.

Chapter I: Andes

The Urban Field: Integrated Community Development

Diet plays a crucial role in the functioning of the body. For the body to function optimally, it must receive certain nutrients to avoid the negative impacts of deficiencies. While the question of what constitutes as the “healthiest” or “best” diet is still up for debate among scientific and anthropological communities alike, the fact remains that the human diet is not the same throughout the world (Wiley 1962 p75). The diet of each group is an example of a particular biocultural interaction that is currently being altered due to the globalization of the western diet. For example, the traditional Inuit diet primarily consisted of meat, since plants were scarce most the year, while populations living in the tropics typically had heavily, plant-based diets since large game was scarcer and plants were more diversified. The American diet, in contrast, is characterized by refined grains, beef, chicken and dairy- with raw plant consumption (vegetables) playing a minor role (Wiley 1962 p76).

The developing world is currently subject to what Corinna Hawkes (2006, p. 1) referred to as a “nutrition transition.” This nutrition transition is characterized by the displacement of raw fruits and vegetables by foods that are high in sugar and fat. Rising rates of obesity and diet-related chronic illnesses such as heart disease, diabetes and some cancers are directly attributed to this diet transition. These low quality diets have provided the paradoxical state of people that may be both undernourished and obese. This is the result of low quality diets producing malnutrition through micronutrient deficiencies, lowering immunity to infectious diseases. This process, according to Hawkes is “deeply rooted in the processes of globalization” (2006, p. 2). Globalization

has made lower quality foods cheaper while at the same time reducing the value of many raw foods to the point that farmers would be better off buying vegetables rather than growing them. The shifting availability of the kinds of foods is an example of the “homogenous processes that can have heterogeneous effects” (Hawkes, 2006, p. 3). Food availability and choices reveal global processes, and the impact those foods may have on a community reveals the contextual nature of these processes. Global processes have distinct local impacts in relation to local ecologies.

It is crucial for a population to be able to attain nutritionally valuable food that includes adequate vitamins, minerals and amino-acids. Signs of vitamin deficiency include a variety of physical, neurological, and psychological symptoms such as rickets, skeletal deformities, night blindness, and depression. It is important to note that poor nutrition does not necessarily mean starvation. Westernized countries are plagued by chronic diseases such as cardiovascular disease, diabetes, obesity, stroke and cancers, many of which have been linked to the Western diet (Wiley & Allen, 2013, p. 91). Globalization and international trade have allowed the Westernized diet to be exported to developing countries, made cheaply available to populations and subsequently altering previous dietary habits. While conducting my research in Ecuador, I had grown accustomed to the mix-matched diet. For example, a hotdog may be served with the traditional cho-cho beans, a legume grown in the Andes that has many nutritional benefits, in particular its high calcium content. In addition, quimbolitos were always served with Coca-Cola, as if that were the way things always had been. It is extremely visible that Western dietary habits have become common in the larger Ecuadorian cities. Chain restaurants such as Pizza Hut, Dunkin Donuts, Papa Johns and KFC can be found

in Quito. But these types of foods are eaten mainly by middle and upper class Ecuadorians. Working class Ecuadorians, while less likely to consume food from Western chains, are more likely to buy the cheap fried snacks that can be bought from any roadside vendor. Coca-Cola however, is ubiquitous regardless of location or socioeconomic class.

As argued by Hawkes (2006), globalization of nutrition has become visible through the rising rates of obesity and chronic illnesses. As of 2010, 66% of Ecuadorians lived in urban areas with 33% in the five largest Ecuadorian cities. Ecuador is currently experiencing such a trend with Type 1 diabetes, cerebrovascular diseases and hypertension related diseases noted as the three leading causes of death for Ecuadorian women (Lucio, et al., 2011, p. 179). Men, in contrast, experienced violence and automobile accidents as the top two causes of mortality, followed by cerebrovascular diseases (Lucio, et al., 2011, p. 180). Though the top two causes of mortality differ for men and women, the automobile accidents and violence simply displace chronic illnesses such as cerebrovascular diseases, hypertension or heart disease. The displacement of many infectious diseases by chronic diseases has been classified as an “epidemiological transition” (Nations, 1986).

Urban Nutrition: Amelia Hidalgo

21 January 2011

I was able to better understand this phenomenon after a visit to the Carmen Amelia Hidalgo elementary school in Cumbaya, Ecuador. The school itself was chosen for the implementation of various projects designed by USFQ’s Integrated Community Development Department. A class of 3rd year medical students was split into groups

focusing on different issues such as eye protection, dental care, nutrition, gender equality, sexuality, and exercise. While the project topics were designed by the medical school, how the projects were implemented was left up to the medical students.

The school itself was physically small but boasted its capability of holding about 500 children between the ages of 5 through 12 years old. The small playground area was cement and the food sold during breaks was made up of a variety of fried chips and sweets.

I was an assistant to the Nutrition focus group and after arriving at the school we were brought to a small classroom that was filled with 32 nine-year-olds. After teaching them a song and dance about the benefits of good nutrition, we started playing a game. Each of the children was given three cut-out images representing common foods such as chicken, candy, bread, or yogurt. The board was then divided into 6 categories: meats, breads, dairy, fruit, fats and sugars, vegetables.

As the children played the game, it became increasingly apparent which food groups the children did not know about. While dairy and fruit was correctly selected 60-80% of the time, proteins and fats were only correctly matched around 20% of the time. The incorrectly matched proteins and fats were frequently chosen to be fruit or dairy. The children did not seem to know how to define fats especially. In addition, when the children were asked the purpose of proteins or sugars, they knew the purpose. This activity demonstrated that poor nutritional choices made by the children were not due to a lack of knowledge, but rather to a lack of being taught the application of the knowledge. The public elementary school had candy vendors, but no fruit vendors, even though fruit

is as cheap as candy there. In this case, food availability played a large role in dietary options. When the only options available are those that are unhealthy, nutrition education can only go so far. Also, the various socioeconomic factors must be considered such as children coming from working-class families whose parents had never been formally educated in nutrition. Diets high in vegetable consumption remain common for working class families; however, these diets are now supplemented with refined sugars in the form of candies and carbonated drinks. One must realize that children have little to no control over their parents' purchasing power and the cheapest food is often the unhealthiest, leading to a rise in childhood obesity and heart problems, especially in the poorest communities.

The experience at Amelia Hidalgo was my first introduction to understanding the nutritional health of people that lived in the Andean region of Ecuador. While those at Amelia Hidalgo were from working-class families that lived on the outskirts of Quito, those that lived in more rural areas faced many of the same, and some very different challenges. While the Westernized diet may have found its way to Ecuador- it is important to recognize the value of local ecologies and that there are different “kinds of bodies” (Lock & Nguyen, 2010). As Quito and its suburbs watched its populations' waistlines increase, the more rural Andean areas were not observed to have had the same trend. However, the areas were nonetheless affected by the dietary shift. As the demand for agricultural products in the form of raw food items declines in Ecuador, the number of Ecuadorians migrating to cities increases.

Baños

20 February 2011

Known for being an adventure-tourist town, the population of Baños is well off compared to the rest of the region. I traveled there as part of an ICDD survey project with another member of the ICDD research faculty to determine whether the nearby Tungurahua volcano was polluting the local river, and if that water was being consumed by residents. It was there that I met Doug, a Kiwi who had moved from New Zealand with his wife to Baños to help pilot an eco-tourist lodge for visitors who were on a layover day to the Amazon. On learning the purpose of the trip, he launched into a frustrated lecture about the problems of the region:

Well you see I don't see the health of Baños itself as affected by the ash as much as the pollution here. I mean sewage is just dumped into the rivers. We're on the backside of the crater so we rarely get any ash fall, sometimes the bugger makes it a bit foggy but that's only if the 'cano is really acting up. If you really want to know the problem, it's the bloody lack of attention to detail. There's no continuity in anything the ministry of public health does. We get the barrels of 'agua potable' here and only use the 'treated' city water for brushing our teeth. You can smell the chlorine on Fridays cause I guess they try to top it off for the weekend when the tourists come but every six months or so we'll come down with giardia just from brushing our teeth. Sure they may put up signs telling us how everything is getting better and how they have all this new technology but the reality is the lack of attention to detail such as training the workers to manage the system properly is costing people their health- everyone knows what the government says is lip-service anyway.

The accuracy of his statements was undeniable. Without continuity, the future of Ecuadorian public health looked bleak. This lack of continuity was to be blamed on the literal lack of continuity in leadership. The lack of detail could be blamed on an extremely centralized health system in a country with 50 different ecosystems. In fact the only continuous factors in the healthcare system seemed to revolve around a low budget and lack of efficiency. The entire concept of Ecuadorian time is the idea that any

appointment could arrive between several hours and several days late. It could be reasoned as the product of the local culture but I have come to suspect that it is a product of the political situation. With a history of 29 constitutions, numerous short term presidents, a collapsed economic system, and many crippling disasters, the people had no reason to expect continuity or promises to be fulfilled. It was not blatant disrespect; rather it was a conditioned system.

While the population that would likely be most affected in Baños would be the elderly of the community who ritually bathe and drink from the Baños del Santa Agua, the sacred springs from which the town gets its name, we were unable to talk with the management of the springs due to a rockslide blocking the path that morning.

On the four hour trip to Baños we had stopped in Salasaca, the target area of our study, and Pelileo, a neighboring community. Salasaca itself is the name of the “town” which is actually composed of 17 different communities who all share the Salasaca ethnicity, an ethnicity with roots in Bolivia and a people who, like many other highland indigenous groups, had been relocated by the Inca *mitimae* system, a practice used by the Incas to help colonize new areas and undermine local resistance (Ades & Graham, 2003). We were especially concerned with evaluating the fluoride levels in poorer indigenous communities such as Salasaca, knowing that the inhabitants would probably be gathering their drinking water from non-potable sites such as the river that runs through many of their communities. In addition, such communities were known for being heavily reliant on subsistence farming, which would be vulnerable to the bioaccumulation fluoride from both the volcanic ash fall and erosion. While many volcanic areas throughout the world have shown a relatively high fluoride composition in the ash and surrounding soils, a

comparison of clinical studies worldwide has revealed a common theme- third world populations are more prone to develop fluorosis as a result of malnutrition. Low calcium, protein, vitamin C, and D increase the risk of dental and skeletal fluorosis which can be better understood as a process of calcification of the skeletal muscles which limits mobility and inhibits movement as fluoride builds up in the body (D'Alessandro, 2006). This process is damaging to those afflicted not only physically but socioeconomically. Decreased joint mobility inhibits efficiency agricultural work. In addition, Salasacans are known for producing intricate textiles which they then sell at local markets and at tourist destinations; those afflicted by fluorosis eventually lose their ability to produce such textiles due to a lack of mobility.

The case of the Salasaca and Pelileo is an example of the complex processes that may positively or negatively influence the health of a region. History placed the Salasaca people in Ecuador, and the location of the volcano is geography. However, the health of the Salasaca people is not a result of any kind of environmental determinism. Nutritional deficiencies have made these people more prone to fluorosis and the socioeconomic status of the region prevents access to clean water. The case of the Salasacan fluorosis is important because it demonstrates the interplay between bodies and the local environment.

In many developing countries, aid organizations focus on reducing the incidence of diarrheal diseases. This narrow focus may, however, lead to more problems without an investigation of the environmental attributes that have nothing to do with anthropological influence. For example, plans to reduce the incidence of waterborne disease in Bangladesh and West Bengal have led to what the World Health Organization

(WHO) calls the “worst poisoning in history.” In this region more than 100,000 people are slowly dying from arsenic poisoning with experts projecting that over a million could be similarly afflicted in the future. This poisoning is the result of a well-intended, but poorly planned development effort by the United Nations’ Children’s Fund (UNICEF) in coordination with the government of Bangladesh. For hundreds of years, waterborne diarrheal infections had been the leading cause of mortality and disease in the area adjacent to the Bay of Bengal. The majority of the population drew their drinking water from wells or ponds polluted with animal and human excrements. In the 1970s, UNICEF started a project that over 25 years, constructed an estimated 3.5-4 million hand operated tube wells. The UNICEF-Bangladeshi government drilled 1 million of these while the remainder was contracted through other international aid organizations. There was no laboratory analysis of groundwater samples throughout the process as water drawn from deep aquifers was considered to be pollution free. The program was originally believed to have been successful, with a sharp decline in waterborne-disease related mortality and 97% of Bangladeshis within walking distance of “safe water” (Nadakavukaren, 2006, p. 525).

By the mid-1990s thousands of villagers in Bangladesh and West Bengal began exhibiting symptoms of chronic arsenicosis. Studies soon revealed that many of the wells contained water with naturally high arsenic levels. Although the WHO standard for arsenic in water is 10ppb, many of the wells contained 500-1000ppb with the highest at 2400ppb. Those affected by chronic arsenic poisoning take ten to twenty years to exhibit symptoms, by that time the poison has accumulated in hair, nails and skin. As the arsenic concentration in the body accumulates, liver kidney and nervous system damage result as

well as open sores and skin cancers. The well-intending efforts of UNICEF and other aid organizations did reduce the incidence of waterborne infectious disease at the cost of exposing millions to detrimental levels of arsenic (Nadakavukaren, 2006, p. 525). In evaluating biocultural interactions, it is necessary to not only evaluate the interaction of humans with the environment and the ability of humans to alter the environment, but it is also necessary to understand the diversity that exists in the environment. In addition, the arsenic poisoning has had cultural ramifications such as the inability of young Bangladeshi women who have been disfigured by arsenic poisoning to find husbands. Young men in the region who have been poisoned find it equally difficult to find employment (Nadakavukaren, 2006, p. 526).

In the case of the Salasacans and the populations of West Bengal and Bangladesh, it was not environmental determinism that led to the poisonings; rather the poisonings resulted from biocultural interactions. The Salasacans continue to drink water that is exceedingly high in fluoride due to socioeconomic factors and are more vulnerable to high levels of fluoride due to nutritional deficiencies. Bangladeshis/West Bengalis, in contrast, were provided access to their water through aid efforts to improve the health of the area and as a result many that otherwise would not have been subject to arsenic poisoning have been affected.

Baños and Salasaca

“¡¡¡Tienes pies grandes!!!!” said a Kichwa girl. Her height suggested she was around four or five but her communication skills suggested that she was really between six and nine years old. She rocked back and forth on our shared bench as she chatted with me incessantly as I waited for the bus to arrive at the station in Baños, Ecuador.

“y eres muy alta. . .”

I had never been called tall before in my life. I had perceived myself a runt only to discover I was a giant. Her seemingly innocuous statement struck me, reminding me of how different our lives were. More than the difference in our skin tone, language, and dress-the height difference placed us in two separate worlds. One world seemed overflowing with ample food and opportunities, while the other world seemed to hang onto every last breadcrumb without letting even a penny go unnoticed. An average adult in Ecuador makes around \$200, with household costs running around \$600 a month. In such a system child labor is necessary for child survival (Acosta, 2010). And that is an average income in a country of have and have nots where the middle class is virtually non-existent.

Our conversation was briefly interrupted by a man that crawled by on his hands and knees, an unpleasant, yet common sight that hinted at the country's long struggle to eradicate polio. The man's Western-style dress along with his affliction suggested that he originated from a city and later migrated to Baños. The juxtaposition of the world of the Kichwa girl alongside the polio crawler illustrated the mobility offered by bus transportation and the disparities that may occur in a rural area in contrast with a city. Though polio has been eradicated from Ecuador, the man was still at risk for the development of post-polio syndrome. Although the official eradication of polio from the Americas was declared in 1994, it would be incorrect to believe that the effects of polio would stop with its eradication. A body that has already been afflicted by polio will act differently than one that has not despite the status of being officially “eradicated.”

The little girl yelled to her mother, “¡Mami, yo tengo sed! ¡Quería una bebida ahorita! ¡Allichu!” Her mother promptly fetched her nothing less than a liter of Coca-Cola, life blood of the Andes. Like many of the Kichwa youth I had met, she spoke a mix between Spanish and Kichwa, not differentiating between the two languages at all but speaking them together in the same sing-song rhythm characteristic of the local indigenous languages. While the words “Mami” and “Allichu” were in highland Kichwa, the rest of her request was in Spanish, “*Mother, I’m thirsty! I’d like a drink now! Please!!*” This code-switching between languages was a visible representation of the pluralism existing in her life between Western and traditional influences. In addition, recognizing the juxtaposition of her code switching with the Coca Cola is indicative of the myth of “isolated populations.” Rather than describing her as a Kichwa from an isolated village, I would like to draw attention to the code switching, the Coca-Cola and that she was waiting for a bus.

As she drank her coke, pausing to ask me where I was from and where I was heading, I thought about the reason why she was destined to be short and why I was in Baños. I also considered the first world malnutrition that had taken hold of Ecuador in the same way it has spread like a plague to many developing countries. The countrywide health disparities had been drastically affected by the refined sugar addiction. Addiction. That’s how my Ecuadorian neighbor described the love of Coca-Cola here; an addiction that knew no socioeconomic boundaries.

The water in Salasaca contributed to an outbreak of fluorosis in those who could not afford bottled water. One must question whether Salasacans would choose water or Coca-Cola if they had the economic means to make such a decision and consider the

ramifications of a possible transition from fluorosis to the spectrum of problems that have been associated with sugar-laden, carbonated beverages. These questions are the type that must be addressed when designing feasible and sustainable health interventions. The earlier mentioned case of the well-intentioned efforts to reduce the prevalence of diarrheal illnesses of Bangladeshis by digging wells failed to ask these types of questions. The result of this short sightedness resulted in widespread arsenicosis. This is not to say that the people should not have been given access to water absent of waterborne pathogens but to address implications of solutions. If Salasacans were able to access Coca-Cola as a result of economic success and chose to follow the pattern of consumption found throughout Ecuador, it would shift their local ecology from an interaction with local water sources to a product such as Coca-Cola. Without an understanding of local ecologies one will overlook these complex biocultural interactions that can only be captured through thick-description and an understanding of the thick dimensions that cannot be revealed through statistical analysis.

Chapter II: La Costa

While Chapter I focused on the role of nutrition in the Andes region, Chapter II shifts to the Pacific Coast. In the Andes region, the factors affecting nutrition were both external in the form of nutritionally poor food and inherent, in the form of the fluoride laden water. Chapter I identified the interplay between socioeconomic influences and environmental variation in relation to biocultural interactions. In Chapter II, the focus is on demographic shifts, globalization, and medical pluralism. Though both these chapters focus on global processes such as the globalization of the Western diet and industry, different consequences of these processes are chosen to emphasize the contextual nature of its impacts.

The relationship between globalization, poverty and infectious disease can be described from an economics perspective, a biological perspective or a sociological perspective, but none of these descriptions would provide the data needed to fully understand the nature of their interrelationships. While an economist may describe the relationships as the result of world markets, a biologist may describe the interconnections as the result of surpassing an ecosystem's carrying capacity. Similarly, a sociological perspective may understand the connection as the globalization of culture in addition to ever-increasing urbanization. Understanding the local disease ecologies allows public health practitioners to be able to design economically feasible interventions and design preventative strategies. The conditions related to the spread of disease are related to these local ecologies, more specifically the particular way the local population engages with the environment.

In 1969 the US Surgeon General confidently announced to Congress that the age of infectious diseases was over for the United States (Wiley & Allen, 2013, p. 270). It appeared that there had been a major epidemiological transition and infectious diseases would no longer be a problem for developed countries. By the 1980s, it had become apparent that the age of infectious diseases was not over with the surfacing of HIV. The early 1990s brought reports of newly emerging and resurgent infectious diseases that were not only spreading geographically, but also were resistant to many antibiotics.

The 1992 report released by the Institute of Medicine on Emerging and Resurgent diseases identified a series of factors that would lead to pathogen emergence (Lederberg, et al., 1992):

- Human demography and behavior
- Ecological changes, including those due to economic development and land use
- International travel and commerce
- Technology and industry (e. g. globalization of food, food processing, drug usage)
- Microbial adaptation and change (e. g. antibiotic resistance, antigenic drift and shift)
- Breakdown of public health measures

A 2008 analysis found that the majority of emerging infectious diseases were bacterial or rekettsial (54%), reflecting the emergence of antibiotic resistant strains (20%). Most were zoonotic (60.3%) and of those 70% were from wildlife (Jones, et al.,

2008). What most surveys of emergent and resurgent diseases concluded is that social processes, sometimes acting through ecological changes, were largely to blame for the surfacing health threats (Wiley & Allen, 2013, p. 271).

Medical pluralism, meaning utilizing multiple medical systems such as ethnomedicine and biomedicine, has been on the front lines of confronting these surfacing diseases. Many of these diseases first surfaced in developing countries that do not completely rely on biomedicine for medical services. Alternatively, a combination of biomedical services and ethnomedicine is used together in understanding and treating disease. Although biomedical services may be the preferred diagnostic method, in many cases ethnomedicine prevails over biomedicine as the primary treatment option due to cultural and economic reasons. While in Ecuador, I had the opportunity to interview Raaj Mehta, a Fulbright scholar from the United States who was in Ecuador doing research on the prevalence of parasitic worms in a community called Quinindé, a coastal Afro-Ecuadorian community.

While he explained to me how he had first gotten involved with the project a year before and described the people there, I noted how similar the story seemed to most health care facilities I had worked with in the country. His lab was basically a kitchen counter; the clinic, a house. Basic sanitation was beyond question and every stool sample was washed down the sink-back into the water supply. Disturbed by the methods he had been instructed to employ, I asked him if their “disposal” methods were adding to the problems in a place with no waste water treatment. His reply was the simple but logical response that he had received when he asked his supervisor about the methods: “In a place where the majority of the population already has these worms, does it really

matter?” While the tropical environment does not inhibit these parasites, it is also not the sole explanation for such high frequencies. When determining why these chronic health issues exist, it is also necessary to question what interventions would even be feasible in such a setting. Unfortunately socioeconomic status is usually the deciding factor of who can afford healthcare; however, if larger umbrella health organizations such as the WHO employ ethno-medicine, cheaper, more accessible treatments could be established.

It is widely recognized that ethno-medicine, more specifically, ethno-pharmacology, has played a critical role in the evolution of western medicine, providing treatments such as quinine against malaria or the various opiates. However, while western medicine diverged to produce plant-derived drugs, ethno-pharmacology remained in support of traditionally used, non-derived plants with reasoning ranging from cultural influence to economic accessibility. In the article “Medicinal Plants in the Evolution of Therapeutics,” Dr. Fernando Ortega approaches the issue from both public health and anthropological perspectives, using an evaluation of a case study of several high-Andean populations and the relative frequency of *Ascaris lumbricoides*, also known as the common round worm.

People throughout the Americas have used medicinal plants for deparasiting for thousands of years. Seeds of *Chenopodium ambrosioides* dating to 2000BC were found in stocks of a prehistoric population that lived in a cave in present day Nevada. Although known by different common names, the same plant is still used throughout the Americas. While many populations distill the plant to produce a product known as Chenopodium oil, for the last six decades other pharmaceutical products have been taking the place of

the oil both physically in the markets and mentally, in the minds of those who have come to believe that western medicine always provides the best options.

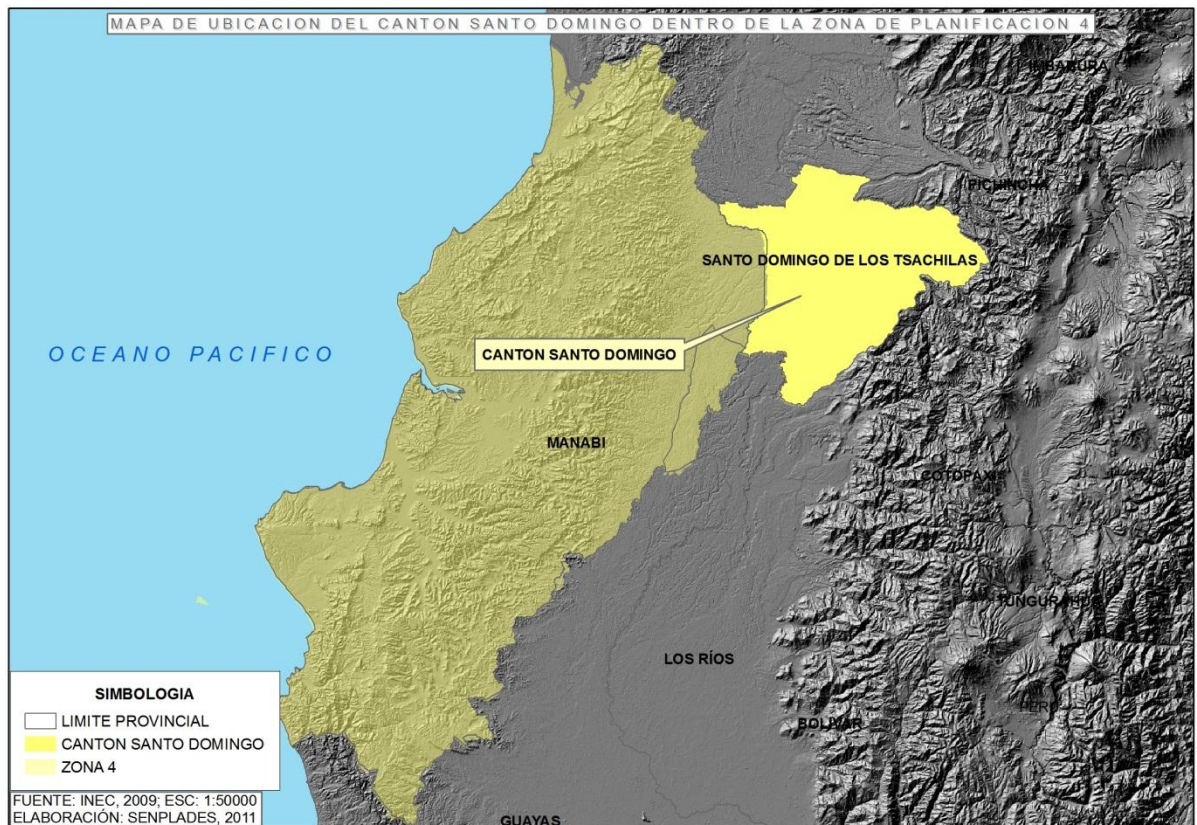
While both traditional and modern chemotherapeutics have shown to be effective treatments, treatment costs favor the traditional method. As part of a public health intervention to reduce the prevalence of the parasite, not only hygienic habits but consistent therapy provides the only sustainable solution. The results of the study recommend that different national and international organizations pursue further investigation in the potential to apply the plant against intestinal worms in school aged children, reasoning that the affordability of such an intervention would allow a larger population to receive treatment, rather than using the budget on expensive pharmaceuticals. The argument presented is not that biomedicine or traditional medicine is better, but that sometimes the better option is an answer to an economic, rather than a medical question.

Periurban Slums

The rapid growth of cities in the developing world has also resulted in the rapid growth of periurban slums with little to no public health access and notoriously poor living conditions. The growth of periurban areas is fueled by a lack of opportunities in rural areas. Studies have found that this labor migration separates families and increases the likelihood of extramarital sex, with a resulting increased prevalence of sexually transmitted infections such as HIV, gonorrhea and syphilis (Wiley & Allen, 2013, p. 272). In addition, these areas rarely have clean water or adequate waste disposal, creating an ideal environment for infectious diseases. The city of Santo Domingo de los Colorados, known locally as Santo Domingo, is a classic example of a city with a high

migrant population, and demonstrates the problems that may result from sprawl in the form of periurban slums. The city sprawl takes the form of mud paths leading to shantytowns with ineffective drainage and various forms of garbage littering empty lots. The garbage ranges from pieces of household appliances to plastic bags, which along with the ineffective drainage, creates an ideal environment to support vectored diseases. In Santo Domingo, dengue fever, vectored by the day-biting *Aedes aegypti* mosquito, is not rare. The mosquito seems to not only survive, but thrive, in such an environment.

Figure 0-1: Santo Domingo de Los Tsachilas (Sistema Nacional de Información 2009)



Community Structure and Health

31 January 2011

My relief at arriving in Santo Domingo after a nauseating drive through winding mountain roads was quickly replaced with a heightened sense of alertness, the type that can only be described as the primordial predator-prey feeling necessary for surviving the urban jungle. As we passed through the muddied streets, Sarah Dobra, the administrative coordinator for a medical clinic in the slums of Santo Domingo, explained to me “you can only understand this city as a result of the complete lack of urban planning.... everything that travels to Quito from the coast goes through here...” When I asked her what kind of things were trafficked through there, I came to understand that it was not only a route for bananas and coffee but also the main trafficking area for cocaine and people, a risky supplemental income for those with little to lose.

Upon arriving at the clinic of a cardiologist, we were quickly ushered into the garage while our taxista kept a robber at bay. While we were shutting the door, a distinctively southern voice knocked me off guard, “Well, welcome to Santo Domingo...”

The voice belonged to gastroenterologist Dr. Nick Nikl who is a medical professor at the University of Kentucky Medical School. Dr. Nick, as I came to know him, quickly launched into a run-down of updates for Sarah while he rushed about setting the table for the night’s meeting.

“You know, even though it’s 7pm and everyone agreed the meeting would begin at 7, I’m finally getting used to the fact that I shouldn’t even start warming the food until it is almost 8...heck, I’ll be happy if they are here by 8:30.”

Sarah then left the room to make some phone calls at which time Dr Nick began to explain to me what exactly was going on, what he was doing there, and how he was surviving Ecuador. The “dinner meeting” was supposed to be between several of the local doctors and the area priests. Understanding that the role of the priests was key to community development in a heavily Catholic country, Dr. Nick had made it his personal mission to repair strained relations between the health and parochial sectors of Santo Domingo. He also was stressed about the state of the clinic as he explained, “I want to run things as we would in the US, first rate care. We are not here to provide second rate care to second rate people, they deserve the best. No more expired meds, no more under qualified people performing assessments.” The desires of Dr. Nick to provide first rate care did not strike me as odd but the declaration of no longer using expired medications or having unqualified medical personnel indicated the reality of how the clinic itself had been operated in the past. Though his aspirations were admirable, it is important to recognize that if the only medicine available is expired and the only personnel untrained, there is not much that can be done without adequate funding.

The reason Dr. Nick was in Ecuador was far less complicated than the circumstances he was forced to confront while in the country. The University of Kentucky had founded the service clinic, Hombro a Hombro, in Santo Domingo and Dr. Nick chose to use his 11 month sabbatical to do service there. As he recounted his life from the previous 8 months, each tragically amusing story seemed to outdo the last. He spoke of fighting off robbers, being electrocuted by

the shower, fearing for his life on taxi rides and the sad story of his pea plants and how the daily floods were killing them.

The tardiness of the dinner guests was symbolic of the toughest transition for him. Coming from a world so punctual that 5 minutes late was considered a gross insult; the concept of Ecuadorian time had turned his world upside down. The concept of Ecuadorian time is best defined as a complete disregard for the existence of clocks and arriving to a place within 3 or 4 hours after the agreed time.

By 8:15pm, a Peace Corps volunteer, two Colombian priests, an Ecuadorian cardiologist and his family had all joined us for dinner. Two of the “problem priests” did not show up but that did not prevent the meeting from going as planned. By the end of the three hour dinner, relations were considered substantially better and plans were drawn up for community development inside of parishes. The setting made a comical scene with the range of people present at a table surrounded by mismatching chairs and walls mounted with Tsachila blankets. If one wasn’t noticing the odd décor or peoples present, then they would probably be overwhelmed by the distinctive humidity, the smell of rot from the tropical environment’s talented decomposition of manmade objects, or the fact that an iPod emitting everything from Jimmy Buffet to the Beatles was playing in the background.

Although the room was filled with symbols of foreign influence, the mounting of the Tsachila blankets on the walls attracted my attention more than anything. Although their dyed red hair gave the province of Santo Domingo de

los Colorados its name, over the years the original inhabitants of the area were displaced to the most distant sectors of the province. Like the blankets on the walls, the Tsachila people were seen as something a tourist could appreciate. Furthermore, the ignored blankets in the face of foreign influences and “bigger problems” signaled the place of the Tsachilas in Santo Domingo’s present society. While they could be appreciated from time to time, the outside influences were valued as overwhelmingly more pressing.

Several days later Sarah and I attended another meeting to gather resources for improving the health of the community. Rather than collecting human resources as we had before in trying to get support from the local Catholic priests, this time we traveled to meet with six members of the Rotary Club of Santo Domingo. The object of the meeting was to gain their support for purchasing inexpensive, efficient water filters made by another non-profit service group known as Potters for Peace. While the filters were simple, they held the potential to improve the health of the surrounding community. After demonstrating to the members the purpose, the president asked to keep one for testing purposes. The Rotarians agreed that it was a worthy cause and decided that if the one filter held up to tests then they would be prepared to invest in 50. With improved health, members of the community would miss fewer work-days and provided the opportunity for a chance to improve conditions.

The community meetings in Santo Domingo reflecting the importance of community structure in health. The poor health of the community members resulted from negative biocultural interactions including contaminated water and a high prevalence of

venereal disease. The intervention strategies were contextually bound to the cooperation of the Catholic priests that held important roles in maintaining community structure.

Periurban Areas and Venereal Disease

1 February 2011

Sitting in a health clinic in one of Santo Domingo's slums, it is difficult not to note the effect of the environment on human health. I'm not just referring to the suffocating fumes emitted by the insect repellent that is cyclically sprayed every 3 hours on the floor or the lead paint preventing Wi-Fi from going through the walls-I'm referring to the patients.

City slums mark the ugly transition from rural to urban life. People are marginalized in every sense of the word. They not only suffer from tropical diseases such as leishmaniasis and dengue fever but city diseases of the poor such as gonorrhea and HIV-AIDS. As I compiled the STD survey data into a biostatistics program, I became fully aware of both the lack of knowledge and observations made by those with no formal education. When asked to name types of sexually transmitted diseases, answers ranged from cancer to pregnancy. While gonorrhea had the highest tally, the most information regarding protection was known by children of 11 and 12 that were already having sex. I was not surprised by the young age but was astounded that some answered the survey saying that they did not want to know how to prevent these diseases. It seemed that they had received some form of education in what diseases they could contract but none in how to prevent it. While reflecting on this anomaly, I realized

that it was not odd at all when I took into account that they were all Catholic.

Catholics are educated against all forms of contraception including condoms. If health education was delivered to the children through the Church, they would not be taught about condoms simply because it is against their religion.

If I had been in a hospital, I probably would have been isolated to an office for doing my work; however, space is a valued commodity in a small clinic. I worked in the main office, the only office in the clinic. As I put my data in I was engaged in many different conversations and encounters. Mercedes, a friendly nurse with several children of her own, asked me about my day while giving me updates on her patients. Her job as a nurse entailed her making the several hour walk daily to visit every one of the 20-40 homebound patients. After she left for more rounds, my attention was then drawn to the front desk.

It is difficult to imagine how things could improve with patients who could barely afford the \$1.50 examination fee. Most of the houses leaked under the 10ft of water that annually inundated the coastal region. There were no paved roads and I was surprised that my taxi did not lose an axle in the process of driving through the deep, muddy ruts that designated the “road” to the clinic.

The more time I spent at the clinic, the more I came to understand the health risks associated with living in a coastal slum. Many children arrived with diarrhea or unexplained neurological abnormalities. And as I worked the desk, compiling surveys, every minute or two I would have to hit the button to let patients in or out of the cement-protected compound.

While Sarah answered emails, compiled budget sheets, and worked on grants she explained to me other meetings she would attend and what Hombro a Hombro hoped to accomplish. Even though the clinic itself was located in a place that was seemingly forgotten by the world, the amount of national and international collaboration for the little clinic was astounding. Although time and money was donated from a variety of sources ranging from the University of Kentucky, to the Universidad de San Francisco in Quito to various non-profits such as the Rotary Club- the clinics needs were barely supported.

While the case of Salasaca made apparent the complex relationship between health, the natural environment and socioeconomic status. The local ecologies and health relativities of Santo Domingo have resulted from and are affected by factors ranging from geography, to religion, to economics and the nature of international and domestic aid. Though it was clear the clinic's needs were supported by donations, the declaration of not using expired medications anymore by Dr. Nick of the University of Kentucky reflected what types of medicines had regularly been used in the clinic. The idea of under qualified people performing assessments also must be addressed in assessing health relativities. The understanding of various forms of STDs was also highly reflective of health relativities with patients naming STDs not traditionally recognized by biomedicine as an STD such as pregnancy. In addition chlamydia, gonorrhea, and syphilis each had multiple ethnomedical definitions that were not recognized by biomedicine. Lastly, religion played a strong role in inhibiting some forms of education in reducing the transmission of sexually transmitted infections. These factors revealed through thick description would not easily be understood through statistical analysis alone. The thick dimensions captured describing local ecologies are necessary for understanding the ultimate cause of disease

in the same way that a comprehensive study of health relativities is necessary for determining the true prevalence of a disease in an area, regardless of its biomedical or ethnomedical definition.

Chapter III: Oriente

Chapter I and II supported the theme that not all bodies operate the same and tested “solutions” may not always function according to plan. The malnourished Salasacans referenced in Chapter I suffered higher rates of fluorosis, while a lack of infrastructure created a nearly impossible situation for the people in Santo Domingo who were referenced in Chapter II. Experiencing these areas as a person living in Ecuador, rather than one that was passing through, allowed me to better grasp how truly diverse the country is and the impossibility of trying to address health in such an ecologically and ethnically diverse country with a one-size fits all approach to producing feasible interventions. While Chapters I and II were focused on regions with access to buses and taxis, Chapter III focuses on an area that has few roads and a small population in comparison to the rest of the country.

The Ecuadorian Amazon, or the Oriente, as it is known to Ecuadorians, is the frontier. There are few roads and those that do exist have been constructed by the oil industry. The issues of urbanization, governmentality, pluralism and the transformation of biocultural interactions are all apparent in this region that has been subject to significant economic pressures. Government encouraged oil development from international companies has led to the development of many frontier towns and deforestation of the Oriente to allow for better development. Although home to indigenous groups such as the Siona, Secoya, Huaorani, Achuar, Schuar, Kichwa, Cofán and several uncontacted groups, in addition to a United Nations Educational, Scientific and Cultural Organization (UNESCO) designated biosphere reserve, the Oriente’s greatest value to Ecuador is in the form of the oil beneath the ground. The Oriente

presents the strongest argument for the relationship between ecocide and ethnocide. The biocultural interactions in this region have been affected by a variety of stakeholders and these interactions have been detrimental to the health of the population of the region.

While there has been extensive investigation conducted in relation to oil contaminants' effect on public health in the Ecuadorian Amazon, few studies have investigated the cultural changes that have resulted from the oil industry and its influence on local health disparities. I was able to observe the localized disparities and contribute to local public health interventions through traveling throughout the provinces in the region known as the Oriente with Dr. Fernando Ortega who at the time was completing a four country malarial survey, focusing on the effectiveness of different methods at reducing malaria rates. The survey work Dr. Ortega completed was funded by the Bill and Melinda Gates Foundation to create a baseline for a comparative analysis of health systems between Colombia, Peru, Venezuela and Ecuador. Interviews were conducted in a discussion based setting, rather than simply conducting a public health lecture. Open ended questions were asked in addition to specifics on local public health services. While the government's greatest problems were related to insufficient human and material resources, the study was able to determine that the environmental degradation of the local environments posed the greatest threat to human health. It is for this reason I chose to investigate both the types of environmental degradation contributing factors.

Historical Background

Five hundred years ago the search for gold began in Ecuador, yet it was not until thirty years ago that the gold rush was fully realized in the form of black gold when the conquest for oil in the began. Rather than searching for a city of gold like the original

conquistadors, these explorers sought the black gold that reposed deep within the ground of the Ecuadorian Amazon. The oil exploration process, like the result, is crude. Seismic testing is used to detect oil; roads are created, indigenous groups displaced or murdered—all before the extraction process even started. An ongoing lawsuit between Chevron and Ecuador attests to the fact that during the extraction process itself facilities were poorly maintained, if maintained at all. In addition, toxic wastewater filled with heavy metals and radioactive materials was either dumped into river systems or buried beneath the ground, from which it leaked into the water table (Kelsh, et al., 2009).

Any one of the previously mentioned ecological disrupters would wreak havoc on public health and in summation, create an ideal environment for the exponential deterioration of public health. While some may argue that the oil industry has brought economic prosperity to the country, on closer investigation one would realize that before the oil industry, Ecuador was debt free. Currently, Ecuador's national debt is \$16 billion dollars—over 80% of its GDP (Falconi-Bernitez, 2004). Rather than leading to long term prosperity, the oil boom has created a resource driven rush by foreign companies into developing countries which do not have the capacity to either assess or prevent possible environmental and public health damage that may result from rapid industrialization. Furthermore, the long-term effects of such practices are supported by the structure set up by the flash-globalization itself. An example of such a product would be the roads and towns that have been created. Without sufficient clean water supplies or feasible waste disposal options, watersheds have become the main dumping grounds of industrial and man-made waste, cultivating infectious disease.

Direct Effects

The effects of oil activities during the last thirty years have proven disastrous for the region. Oil exploitation in the northern Ecuadorian Amazon is responsible for 2 million hectares of deforestation. More than 650,000 barrels of crude oil have been spilled in forests, rivers and estuaries. Toxic substances resulting from oil exploitation, such as heavy metals from produced water, have polluted water sources in the region. Women who drink water within 200 meters of oil facilities have 147% more spontaneous abortions than those living where there is no pollution (Frente de Defensa de la Amazonia, 2010). Communities near the oil industry exhibited triple the cases of skin infections and twice as many cases in mycosis, anemia, urinary tract infections, tuberculosis and malnutrition.

The oil facilities themselves are in indigenous territory. There are eight indigenous nationalities in the Ecuadorian Amazon and six protected areas that have been and continue to be affected by these activities. Wild animals are especially sensitive to pollution, noise pollution and deforestation, causing many indigenous peoples to convert from hunting to purchasing food (Frente de Defensa de la Amazonia, 2010). Implications of this shifting local ecology has changed the dietary habits to favor more packaged and preserved food in addition to higher levels of alcoholism in communities. In the case of the Cofán Dureno community I visited, vendor access was visible through the Spam, Coca-Cola, and Pilsner beer packaging that was piled beneath the raised houses.

Indirect Effects

The indirect effects have come in the form of towns, roads, and the dumping of human and industrial wastes into waterways. Several indigenous groups like the Cofán, Siona and Secoya have become minorities in their own territories as a result of development in

the Oriente. In Amazonian communities associated with the petroleum industry the child population has significant levels of malnutrition (43%) compared to people living far from the oil industry (21.5%). General mortality rates are also twice as high in communities in close proximity to petroleum activities, with the most common causes being cancer, violence and accidents (Frente de Defensa de la Amazonia, 2010). These rates are reflective of the structural barriers in accessing health care in addition to poverty.

Although history provides many illustrations of the disastrous effects of ignoring the link between ecology and health, it continues to be either seen as the price paid for investments or a necessary evil that cannot be avoided. While the construction of the Panama Canal demonstrated the amplifications of pathogens through the altering of their natural environment, the construction of the Trans-Amazon Highway that runs from the Atlantic to the Brazil-Peruvian border provided an example of how roads not only allowed for the greater mobility of people, but disease as well (Eisenberg, et al., 2006).

New roads change migration rates and it can be argued that rapid demographic changes, caused by roads, reduce social cohesiveness within a community. A reduction in social cohesion would compromise a community's ability to maintain good sanitation and hygiene. Roads introduce outsiders to a community, disrupting cohesion and a sense of connection in the area. Whereas a community might have had its own system for maintaining hygienic standards, a community of outsiders has very little communication in comparison. The correlation between several pathogens and roadways were studied in northeastern Ecuador, and it was possible to determine that not only was there a correlation, but enough evidence to suggest causation on the part of roads in the increased

prevalence of several pathogens that cause dysentery (Eisenberg, et al., 2006). The same case may be seen in the Ecuadorian Amazon and while fecal-oral transmission through contaminated food or water is one common route by which pathogens have spread through increased urbanization, insect-vectored pathogens have been particularly successful in frontier territories. Although fecal-oral transmitted pathogens rely on contaminated substances, insects such as mosquitoes have the mobility to not only affect neighboring villages, but countries as well. While planes and ships have transported mosquito vectored diseases such as dengue fever and malaria to Ecuador, the construction of roadways has allowed these diseases to spread from the coast all the way to the Amazon lowlands (San Sebastian, et al., 2000).

While the bacterial and viral pathogens may attack a people from the inside, the social conditions created by expansion attack the culture itself. One such example is that of the Huaorani, infamous for the spearing incident of the missionary Nathaniel Saint and countless oil workers. The Huaorani have been experiencing rapid cultural and ecological transformations as the oil industry has invaded their territory. One of the first roads created by oil companies that penetrate Huaorani territory is known as the Via Auca or “Savage Road.” When one drives down the road the skeletons of cultures may be observed. Although traditionally cultural change is understood as the product of pressures leading peoples to adapt to ensure survival, it would be incorrect to assume that the shift that has occurred in Amazonian indigenous cultures to be typical of socio-cultural evolution. For example, when western assumptions challenged these peoples’ traditional notions of how to claim territory, groups were forced to stay in one settlement rather than living their semi-nomadic lifestyle. This shift led to increased rates of

diseases such as E. coli, cholera, and tuberculosis. Furthermore, the shrinkage of territorial size and increased proximity to trade centers led to an increased prevalence of malnutrition, limiting traditional food and forcing peoples to become heavily reliant on sub-par products such as canned lunch meats, white bread, and Coca-Cola (Kane, 1996). The incidence of alcoholism is increased in settlements that hold a close proximity to the ever expanding road system of the Ecuadorian Amazon and the road system itself acts as a “pathogen highway,” expanding the territory of non-endemic diseases such as malaria and dengue fever (Desowitz, 1991).

The Huaorani are not alone. Other groups such as the Cofán and Kichwa have also noted shifts in their culture and health patterns over the past 30 years. Unprecedented cancer rates, an increase in parasitic infections due to lack of treatment, and alcoholism have accompanied much of the industrial development in the Oriente. Traditional medicine has been put aside in favor of what one Cofán leader referred to as “the new way” in reference to the use of biomedicine (Ortega, 2009). The fight to save their culture and ultimately health has come in the form of ecotourism, which has led to greater conservation protection, sustainable income, and self-respect (Cepek, 2008).

Structural Barriers

The first clear barrier is a structural barrier towards maintaining or improving public health in areas with degradation. Health centers in the frontier of Amazonia are scarcely larger than a small house with enough patients to fill a modestly sized hospital. After speaking with the regional director of vectored disease control at their provincial office in a frontier city called Lago Agrio, it became more than clear to us the structural barriers that needed to be taken into account when designing intervention strategy. The

following field notes demonstrate the types of structural barriers encountered by public health officials:

The center was made up of two rooms on the first floor with a second floor for administrative duties. We found the regional director, Dr. Oscar Lopez, on the backside of the building with two other men attempting to repair a canoe motor. Upon seeing us, we were invited to join him on the second floor to conduct the interview.

Dr. Lopez's chief complaint was that of insufficient resource both human and material. He commented that in the communities "the problem isn't even the lack of fumigation, it's that in the communities everything is dirty, their homes are dirty, there is trash everywhere." When we asked him about the accessibility to some of the more distant communities he replied "we have a canoe, we're working on fixing the motor but the canoe itself is too deep for the rivers around here during the dry season."

He later noted that in the past three months only 14 cases of malaria had been reported in the three Amazonian provinces that he directed and told us to speak with the Orellana provincial office, that they would have someone who could shed some light on the low malaria rates.

When we arrived to the Orellana provincial office in the city of Coca the next day, we were met by the head public health entomologist of the Oriente's vectored disease control program. The name of the public health entomologist is Gonzalo Shiguango. With a background of being ½ highland and ½ Amazonian Kichwa he was not only able to identify with the people in the villages but went to them as a Kichwa, speaking to them

in their own language saying, “look at you, look at your house, so dirty-why should I help you if you keep your house like this?” When he returned a month later and the houses were spotless. What is important to recognize in this case is that it was not his position as an employee of the Ecuadorian Ministerio de Salud Pública but his position as Kichwa that led to his ability to effectively communicate with the Kichwa in the community. It is also reflective of the importance of speaking with a community rather to a community, in a way that may be best understood by the community itself.

Gonzalo had been working since 4 a.m. that morning traveling to different areas of the Oriente, some of which were 4 hours away. My supervisor, Dr. Ortega, reflected that the major difference he had observed between Ecuador and the other countries he had visited was the amount of commitment on the community level. Rather than sitting in offices all day, the Ecuadorian public health workers were out working with the communities, much of it on their own time and with their own money. Even in the Succumbios province, the public health workers had been making earnest attempts to reach the communities with their limited resources.

That afternoon Gonzalo, Dr. Ortega and I traveled to a Kichwa community about an hour outside of Coca. The community entrance was guarded by an oil facility checkpoint guard but since we were traveling in a Ministerio de Salud Pública (MSP) vehicle no questions were asked. Twenty minutes down a semi-graveled road we encountered a man on the side of the road named Juanito Aguinda . Juanito immediately met the entomologist from Coca like a brother and insisted on telling us the story about how things had changed since Gonzalo began working with them. He said that not as

many people got sick anymore and they had not had any cases of malaria for quite some time.

The comparison of the Cofán and Kichwa communities illustrates the point that although both possessed equal access to resources, it was the role of culture that had the biggest impact on implementing public health strategies. Juanito told us “I like the public health doctors a lot, I like collaborating; it has helped us so much...even though they do like to give us surprise visits sometimes like today-it helps us.” The collaborating Juanito referred to was the involvement in the community the public health workers had and the integrated element of public health into community life. The model worked because it removed a barrier between the government and community through speaking to the community in a language it could understand. Rather than preaching to the community in Spanish, this model promoted cohesion between public health authorities and communities through speaking with them.

Cultural Shift

Many of the existing health problems are heavily associated with the general environmental deterioration that has resulted from the cultural shift towards a more “westernized” living style while maintaining other parts of their culture. It is also clear that it is not due to ignorance but a lack of viable alternatives. Such was the case in the Cofán village near Dureno that I met with:

15 March 2011

After greeting several members of the community, we were led to the community gathering house which was essentially a small sheltered pavilion made of cement. While Fernando spoke with some of the community leaders about

gathering a group for the presentation, our community contact, Fausto Criollo, and I set logs in a circular pattern to act as seats. The pavilion itself was surrounded by many beer caps.

Within ten minutes about 15 adults had assembled with 10-12 children running in and out, curious to see what we were doing. While the presentation itself lasted about 30 minutes the community discussion lasted nearly 2 hours. We discussed not only vectored disease but community problems as well. They told us they have water storage tanks but they get their water from the river for the tank and lack the chemicals to treat it. They said that they had mosquito nets and were using them, but when we physically examined their homes we discovered that their “nets” were old bed sheets.

As we made our way to the canoe-launch point, the children yelled goodbyes to us from the river where they were not only bathing but drinking the water as well.

The Cofán were first contacted 30 years ago and within that time have seen their population shrink from 15,000 to 400 living on their ancestral lands. According to Fausto, out of those 400, 60 were school aged children with many more even younger (>15% of the community is children). Jobs went to the men who worked in the oil industry, were vendors, or were unemployed. While we observed Cofán children drinking from the river and others bathing in it- I was reminded that the river itself, the Agua Rico, was extremely contaminated both as a result of direct oil contamination and the sewage that was dumped into it by nearby “frontier towns.” One might question why

these people continue to choose practices that will make them sick but in reality it is not a choice-it is their only option.

The indigenous inhabitants had their understanding of nature redefined by those who saw them as pests. Similar to ridding a barn of rats so it could be used, these outside influences have forced the majority of Amazonian peoples in Ecuador to lose between 60 and 100% of their ancestral lands (Ellen, et al., 2000). The resulting environmental degradation has led to ethnocide, poverty, hunger, and a perverted sense of place. Indigenous peoples are forced to cut paths to claim their own land. Even still, oil companies have laid down roads through these territories followed by colonists and industrial expansion (Kane, 1996).

The indigenous reactions to their changing environment have been varied but two main structures have developed from these reactions. Oversimplified, these two may be known as the dependent and the independent models of indigenous existence. While the dependent model is best characterized by those who have had everything they possess given to them in the form of bribes from oil companies, the independent model may be seen as those who have become entrepreneurs in the eco and ethno-tourism industries. The resulting attitudes towards the environment have thus been re-inscribed as a means of survival. The dependents have been described by other Ecuadorians as the colloquial term for sloth, *perezosos*, or literally as “lazies.” The derogatory term reflected the belief that the people who have had their homes built by the oil companies out of cement are lazy. Lazy is the easiest explanation for why these people regularly set up self-run toll booths and charge anyone going through “their road” and choose to live in filthy environments, surrounded by trash. In contrast to the dependents, the more autonomous

groups, regardless of their proximity to development, have sought to maintain their way of life through eco-tourism projects, targeting the western 'love' for nature (Alvarez, 2011).

As part of an ongoing United States Agency for International Development (USAID) project, efforts have been made to educate various indigenous groups and colonists alike on conservation strategies. The peoples referred to as perezosos have insisted that they be paid to show up, paid to learn, and paid to carry out the proposed plans. The independent indigenous groups have taken it upon themselves to educate everyone in the community of such methods so as to maintain a continuity of their culture. The mestizo colonists, most of who are from the Sierra or Costa regions have also embraced the free education, viewing it as a way to improve the health of their environment (Alvarez, 2011).

Governmentality: Policy Barriers

The policy of Ecuador promotes the rapid and unchecked development of the Oriente. Ecuador's policy for settlement of the Amazon is based essentially on the 1978 Law of Colonization of the Amazon Region. This law has the status of "special law," meaning that it takes precedence over any other legislation pertaining to the same matter. It establishes that occupation of the Amazon should be encouraged as an urgent national priority (Hicks, et al., 1990). Under the general spirit of the law, settlement is viewed as a social and resource utilization policy instrument to relieve Ecuador's most densely populated areas. To this objective, all government agencies and bureaus are required to work together to facilitate the settlement process (Pichon, 1992).

The current public policy and investments for the Amazon have encouraged the occupation of the region by migrant settlers; however, public infrastructure has been focused on support to the petroleum industry. Rather than aiding the new migrants, the greatest share of petroleum revenues is capitalized outside the Amazon region while the livelihood of virtually all of Amazon population depends on the health of the agricultural sector that has been consistently polluted by the petroleum industry over the past 30 years.

The current policy has encouraged rapid urbanization with little attention given to environmental stabilization or creating infrastructure to promote long-term human settlement adapted to the peculiarities of the Amazonian environment. I observed this problem in all of the frontier towns we visited while conducting the surveys where the buildings all seemed architecturally geared towards life in the mountains. Rather than constructing buildings to stay cool, these buildings maintained the heat of the day, well into the night. Furthermore the economic, environmental, and health instability faced by migrants as well as indigenous populations reflects the inefficient policies produced by a government with limited resources that continues to endorse a half-hearted support for land colonization (Fundacion Natura—Fondo Nacional de Preinversiones, 1988).

Discussion

Careless development, catalyzed by the resource demands of western civilization and implemented by those who had neither the knowledge nor skill in preventing or reducing the risk of health degradation has led to epidemics in not only Ecuador, but throughout much of the developing world. Although most of these illnesses will not kill adults, the missed work-days lead to further socioeconomic problems. If parents contract

malaria and cannot work, the ability to maintain a hygienic home environment is reduced, putting children at an increased risk for diarrheal diseases which are major causes of mortality and severe morbidity in children (Eisenberg, et al., 2006).

Through examining the complex factors that act as key determinants of health, such as public policy and unchecked development, in addition to the cultural adaptations of indigenous peoples, many of which contribute to health degradation, it is clear to see that any solution will involve action from the community to the international level.

The case of Ecuador is one of what may occur in a country with an unchecked system. The world's attention was drawn to the disastrous effects of the petroleum industry's pollution because of the level of ecological damage and blatant human rights violations, an accusation that focuses specifically on the oil contaminants and does not even attempt to assess the total damage done by the unchecked development. The health relativities are visible through the public outcry against the high cancer rates in the areas contaminated by oil, while the high infant mortality and violence death rates are contextually normal.

The case of Ecuador supports the argument that "Environmentalism" should not be viewed as political ideology but rather should be considered as a key component in constructing sustainable public health interventions both on the international and local level. Community health is interwoven with the health of the environment itself. Local ecologies are currently being shifted in developing countries globally.

Rapid globalization has created a number of public health problems and only through attacking the problem through raising corporate accountability standards, increasing environmental remediation in degraded areas, and pursuing the construction of

public health education interventions in the language of these communities can the process be halted, and hopefully reversed. The collaboration between conservation biologists, community leaders, and public health officials is needed to execute such a plan to repair the long term consequences of uninhibited, rapid development. The relationship between ecocide and ethnocide in the area is recognizable. The subsequent impacts of these two phenomenon shifts the local ecologies and impacts the health relativities as is observable through increased rates of infectious and chronic diseases. Lastly, it is important to note that societal change in itself is not bad except for when it does not happen within a society's own terms.

Looking Forward

As was presented in the various examples throughout this thesis, globalization, though appearing as a homogenous process on the international level, creates heterogeneous effects on the local scale. The health impacts of these processes have been presented in this thesis with a reflection on which interventions have worked, which have not and why. The utilization of Ecuador as a study areas provided the opportunity to observe different health relativities in relation to the local ecologies. Ecuador's high ethnic diversity also provided examples of how different groups may be impacted in relation to the culture. Global processes today, ranging from the globalization of Western dietary practices to foreign-driven resource extraction and global climate disruption, require an in-depth understanding of how biocultural interactions occur on a local level within the context of the global processes. It is only through thick description that many variables may be extracted that would otherwise be ignored by statistical analysis. In addition, the evidence presented by this thesis demonstrates the inadequacy of a global solution to global problems. Though global processes may be the catalyst, differing local ecologies create the necessity for contextually based solutions.

On a final note, the importance of health relativities as a result of local ecologies cannot be overstated. Without an appreciation for these health relativities, biomedicine will continue to underestimate the prevalence of diseases that are underreported due to the fact that they are "normal." Statistical analysis is only as helpful as the data it gathers, which is why a thick description is necessary for understanding the shifting local ecologies that subsequently impact health relativities.

Appendix

Figure I: Women Mortality Rates: Ecuador 2008

(Lucio, et al., 2011)

DIEZ PRINCIPALES CAUSAS DE MUERTE EN MUJERES, ECUADOR, 2008

<i>Enfermedad</i>	<i>Número</i>	<i>Tasa*</i>	<i>%</i>
1. Diabetes mellitus	1 931	28.0	7.6
2. Enfermedades cerebro-vasculares	1 685	24.5	6.6
3. Enfermedades hipertensivas	1 580	22.9	6.2
4. Influenza y neumonía	1 521	22.1	6.0
5. Insuficiencia cardíaca	1 183	17.2	4.6
6. Enfermedades isquémicas del corazón	1 056	15.3	4.1
7. Enfermedades del sistema urinario	933	12.0	3.2
8. Neoplasia maligna del estómago	719	10.4	2.8
9. Neoplasia maligna del útero	708	10.3	2.8
10. Cirrosis y otras enfermedades del hígado	665	9.7	2.6

*Tasa por 100 000 mujeres

Fuente: Referencia 2

Figure II: Male Mortality Rates: Ecuador 2008

(Lucio, et al., 2011)

DIEZ PRINCIPALES CAUSAS DE MUERTE EN HOMBRES, ECUADOR, 2008

<i>Enfermedad</i>	<i>Número</i>	<i>Tasa*</i>	<i>%</i>
1. Agresiones	2 279	32.9	6.6
2. Accidentes de transporte terrestre	2 188	31.6	6.3
3. Enfermedades cerebrovasculares	1 723	24.9	5.0
4. Enfermedades isquémicas del corazón	1 704	24.6	4.9
5. Enfermedades hipertensivas	1 685	24.4	4.9
6. Influenza y neumonía	1 666	24.1	4.8
7. Diabetes mellitus	1 579	22.8	4.6
8. Insuficiencia cardíaca	1 134	16.4	3.3
9. Cirrosis y otras enfermedades del hígado	1 127	16.3	3.3
10. Neoplasia maligna del estómago	945	13.7	2.7

*Tasa por 100 000 hombres

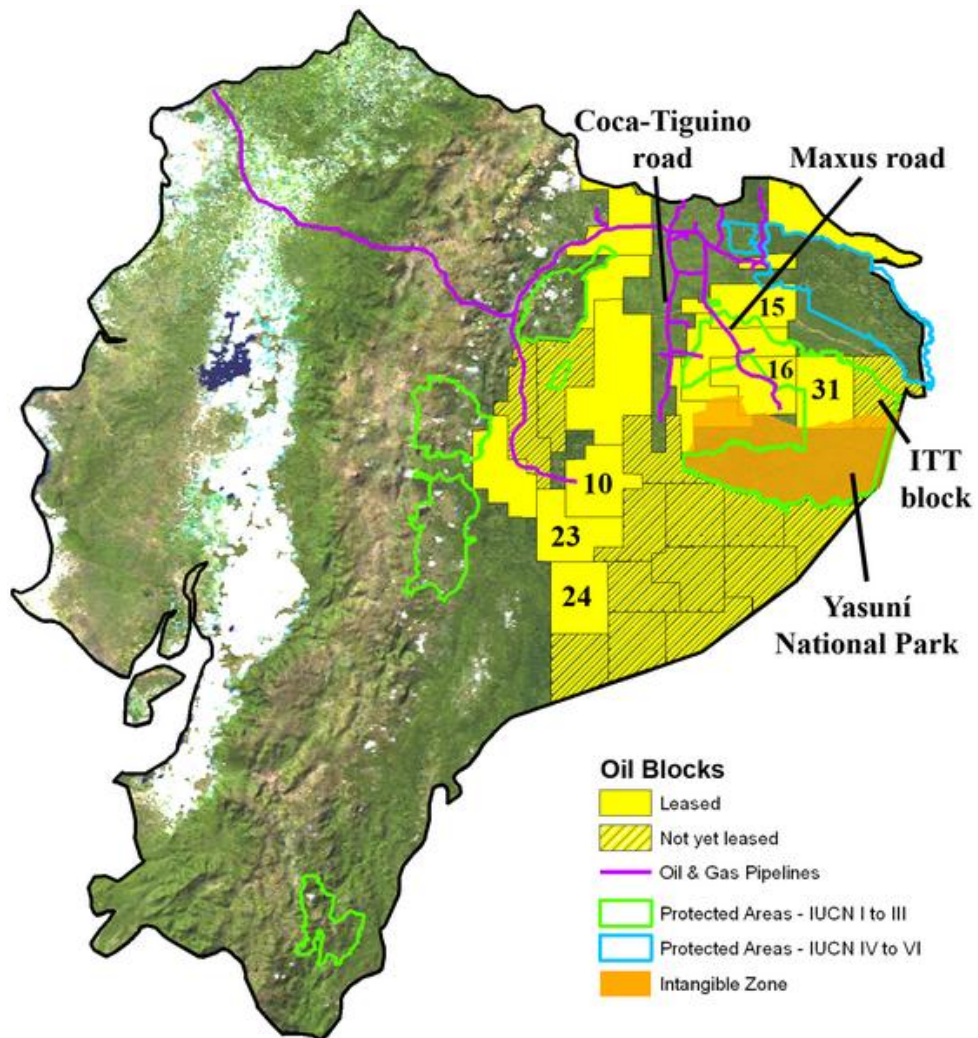
Fuente: Referencia 2

Figure III: Environmental Zones of Ecuador:
(Schweitzer, 2011)



Figure IV: Oil Blocks

(Ministerio de Minas y Petroleos, 2009)



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