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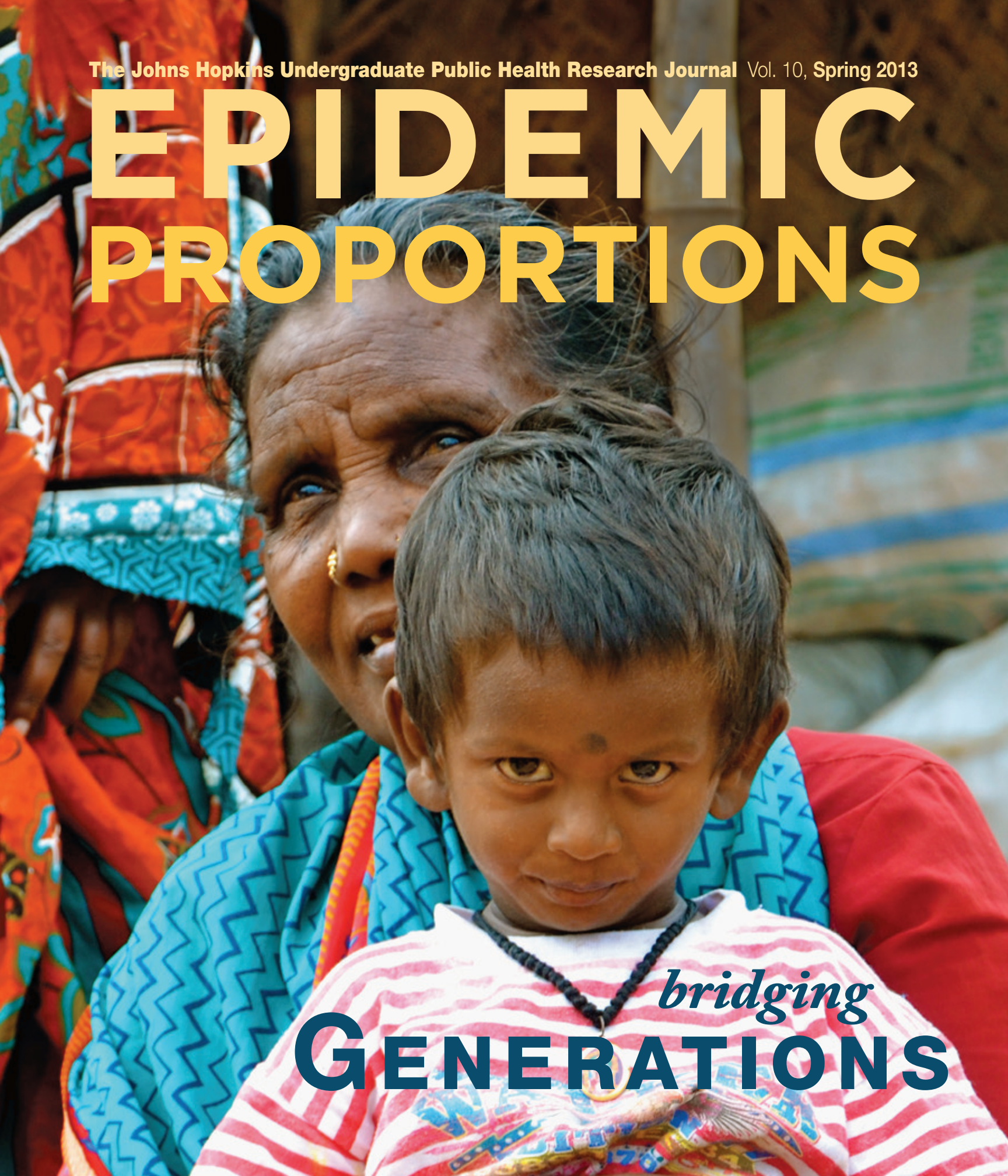
EPIDEMIC PROPORTIONS



bridging
GENERATIONS

Two miles off the road on the way to Chromepet, the little dry grass that speckles the sides of the asphalt fades to a cloud of dust concealing an unnoticed village. The uncommon sound of approaching cars gather all of the curious villagers, eager to share stories of displacement and kinship alike. This is no one's home, a village never meant to exist, they explain. It is here that the all-too-forgotten dwell together under a single streetlamp. And it is here that a new generation has been born. | Uncharted village slum near Chromepet, Tamil Nadu.

Front cover photo courtesy of Kavya Vaghul.

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ABOUT THE JOURNAL

Epidemic Proportions is a public health journal designed to highlight JHU research and field work in public health. Combining research and scholarship, the journal seeks to capture the breadth and depth of the JHU undergraduate public health experience.

SUBMISSION POLICY

Any interesting student experiences locally or abroad such as research, volunteer work, or editorials are all welcome!

Please submit all articles to ep@jhu.edu.

FEATURES

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LETTER FROM THE EDITORS

Welcome to *Epidemic Proportions*!

On behalf of the entire staff of the Johns Hopkins Undergraduate Public Health Research Journal, we are proud to showcase the diverse experiences and accomplishments of Johns Hopkins undergraduates and faculty. This issue will take you, the reader, on a timeless journey of public health. Despite the diversity of the world, we believe that there is one universally recognized song that best represents the importance of this issue to our journal: "Happy Birthday". Ten years ago, *Epidemic Proportions* existed only in the united vision of two undergraduate students and one faculty advisor, Dr. James Goodyear. With this issue's theme of *Bridging Generations*, we seek to celebrate the past ten years of our journal and the past centuries of discovery in the field of public health.

You will find small "Historical Perspective" boxes interspersed throughout the many articles in this issue. These sections were created by dedicated staff members to provide historical insight into the public health issues presented in the article. We hope that these boxes will instill a sense of appreciation for some of the triumphs of public health. Our staff is also pleased to present to you an *Epidemic Proportions* timeline. This timeline, found at the very center of this issue, has select quotes from all ten published issues of our journal. It is our hope that this timeline shows the depth and breadth of the Johns Hopkins public health experience covered by our journal in just ten years.

Our focus on the past and present is supplemented by the many eclectic public health challenges highlighted in this issue. This issue explores an entire range of topics, including behavior, Maryland's culture of innovation in primary care and quality improvement, and injury prevention advocacy. On a more biological note, articles probe the causes of nodding syndrome, the impact of genetically modified organisms, and the association between the flu vaccine and mother-to-child antibodies. These topics only provide a sample of the public health issues that arise in fields all over and are but a taste of the many that are discussed in the pages that follow.

Public health is limitless. Its influence spans over countries, continents, and even generations. We are humbled by the tireless efforts of Johns Hopkins community and public health practitioners around the globe to improve the human condition. Our journal is a reminder of these efforts and of how the past, present, and future of public health remain connected. The past decade of our journal serves not just as a tribute to public health experiences, but also as an instrument to spread awareness, fuel discussion, and stimulate innovation and leadership. We envision *Epidemic Proportions* perpetuating this honorable tradition for many decades to come. As we blow out the candles on our 10th anniversary issue, we would like to give thanks to our insightful authors, our wonderful advisors, our dedicated staff, and you, the reader.

We hope you enjoy this year's issue of *Epidemic Proportions*, *Bridging Generations*.

Sincerely,

Pujan Dave

Brian Ho

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Faculty–Research Scientist, Department of Nutrition,
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Co-Founder of *Epidemic Proportions*

COVER LETTER

The Epidemic Rise of the Public Health Undergraduate Major: A Core to Build a Professional Corps for Global Health

As the journal *Epidemic Proportions* (EP) approaches the 10th anniversary of its founding, it has much to celebrate. In 2003, the journal was nothing more than mere ideas on a chalkboard and lofty ambitions in the passionate minds of a cadre of public health students to create a transformative platform for the Johns Hopkins University (JHU) Public Health Studies (PHS) program.

Just 10 years ago, the JHU PHS major had fewer than 50 students. In fact, before 2000, the undergraduate study of public health only existed in sub-concentrations of broader Natural Science and Social Science majors. The increase in enrollment from nine students in 2001 to more than 350 in 2013 has been meteoric—nothing less than of epidemic proportions. No longer is JHU regarded merely as a pre-medicine mecca. It is now regarded as the pre-eminent public health mecca for students around the world for 'saving the world.' Indeed, the PHS program has stood as the largest major in JHU School of Arts and Science (A&S) for the past 6 years. Furthermore, PHS also has attained the distinction as the top major of initial choice among all undergraduates, as well as among the highest retention. Indeed, PHS students are most loyal and dedicated—with the PHS program expected to graduate more seniors in 2012-2013 than any other major.

Many don't realize how important and central EP was to the recognition and rise of the JHU PHS program and to the formation of JHU as a public health mecca. Our first issues of EP literally flew off the shelves—all initial prints were taken within an hour of its premier at both A&S and Bloomberg School of Public Health (BSPH). Further, when BSPH conducted its search for a new dean of the public health faculty, the Provost office made EP required reading for all BSPH search committee members and all candidates for the dean position. Although the PHS program was likely already attractive to truly passionate public health students, EP helped accelerate and solidify the public health movement by showcasing the energy, passion, and keen competency of JHU PHS students to the administration and to the world. Thus, every issue of EP was worth its weight in gold in building the PHS to what is it is today—a professional undergraduate academy for public health.

The professionalization of public health has brought forth the rise of the PHS major, and, in turn, the PHS major has brought forth the public health sciences into the undergraduate domain. Students in the JHU undergraduate PHS program now take as many classes in epidemiology, biostatistics, health policy, and environmental health as most MPH students, and they have the option to further train in PhD-level courses. Indeed, as exhibited by the breadth and depth of the many research projects showcased in EP, PHS students rival the training of graduate students. PHS alumni have further gone on to garner high distinctions in public health and policy.

In just over a decade, thanks to EP, passionate student-editors, excellent leadership and advising of PHS directors Dr. James Goodyear and Dr. Kelly Gebo, and dedicated PHS staff, the program has risen from a fledging major to the largest major at JHU. EP's contributions have developed JHU to be a critical core for establishing a professional corps for global health—a corps that aims to tackle and solve a broad set of public health challenges that rivals the Epidemic Intelligence Service at the CDC. Thus, I wonder what the JHU PHS program will bring in the next 10 years. What new revolution in public health will future students beget? What global change will alumni of the program bring in the coming decades? Indeed, 'one brilliant thought can change the world'—what shall we have in mind, to save the world, for all mankind?

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RESEARCH

New Learning Curves: miners' children learning on the quarry slopes | Chromepet, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Jason Oh | *Public Health Studies, Class of 2013*

Investigating the Unknown Cause of Nodding Syndrome: Epidemiological Surveillance and Exploratory Fieldwork in Northern Uganda

BACKGROUND

Nodding Syndrome is geographically clustered near the Aswa and Pager River of the Acholi Sub-region in northern Uganda as well as in Western and Central Equatoria in southern South Sudan. Northern Uganda and southern South Sudan have both been affected by instability caused by decades of violent conflict resulting in exacerbated disease states and destroying health systems.

The Acholi Sub-region in northern Uganda comprises of 7 districts. Nodding Syndrome has been found in Kitgum and Pader districts with recent reports in the eastern Gulu district. The Aswa River flows through Pader and Gulu districts. The Pager River flows through Kitgum district. Both rivers, which feed into the Nile River, have many tributaries and small branching seasonal streams.

Past Research

Nodding Syndrome (NS) is an unexplained neurologic illness that has been reported among persons in several sub-Saharan African countries in recent years, and in 2 of the 3 regions where it has been reported, it has occurred among internally displaced persons or those formerly displaced and later returned to their villages.[1-5] Nodding Syndrome is a clinical constellation of symptoms that begins with head nodding and later results in progressive neurological deterioration. Onset commonly occurs children between the ages of 5 and 15 years. The most characteristic feature is a paroxysmal "spell" in which the head bobs forward repeatedly over a period of minutes; in most cases, the child appears unresponsive during the episode. The disease has been investigated previously in Southern Sudan in 2001-2002[3] and Tanzania in 2008.[1] Louise Jilek-Aall, a Norwegian physician, first encountered a disease that is today believed to have been Nodding Syndrome in Mahenge, southern Tanzania in 1959 and described her findings in a 1964 paper.[6] Despite these investigations, the etiology of the disease remains unknown.

The Ugandan Ministry of Health began investigating a cluster of cases of NS in early 2009 and made several trips to the town of Kitgum over the course of the year in an attempt to understand and control the disease. It was estimated by district health officers that the current outbreak in Kitgum District may affect up to 2000 children. It was believed at least 1000 children have the classic nodding presentation, and 250 have nodding along with generalized seizures. However, the true prevalence and incidence are unknown. Subsequent initial investigations resulted in the generation of an extensive list of possible causes for the syndrome including viral, bacterial, and parasitic infectious diseases; nutritional deficiencies; genetic disorders; exposures to heavy metals or pesticides; slow virus or prion diseases; exposures to munitions from the wars and conflicts; post-traumatic stress; mass hysteria; and pseudoseizures. Because of the complex nature of the disease and the range of possible etiologies, the Ministry of Health soon requested assistance from the U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) to conduct a more detailed investigation.

The investigative approach was multi-faceted and included a formal review of existing knowledge about the disease, the establishment of a multidisciplinary investigative team, and a phase of hypothesis refinement using qualitative focus groups and key informant interviews. A detailed multidisciplinary investigation of a series of cases included collection of information on demographics, possible epidemiological and environmental exposures, general physical examination, nutritional and environmental assessment, psychiatric assessment, neurological evaluation, and laboratory specimen collec-

tion.[7]

The prior investigation by the CDC and WHO suggested that Nodding Syndrome is a distinctive clinical entity affecting many children in Kitgum District. In addition, NS in Kitgum District shares most of the epidemiological and clinical features of previously described NS in Southern Sudan and in Tanzania. It is likely that the illnesses occurring in these three geographic areas represent the same clinical entity.

In the limited number of children examined to date, features seen in complex partial seizures and atonic seizures have been documented across health centers. Results suggest that NS represents a true neurologic illness, and is not the result of mass hysterical illness, psychogenic or pseudoseizures, myoclonus, syncopal episodes, or purely behavioral or psychological after-effects of the war.

The previous investigation indicated Nodding Syndrome emerged in the Acholi Sub-Region around 2003. This coincides with the 2000 gold exploration in Kabong and the recent phosphate mining in Moroto district of the Karamoja region. The geographical clustering of the disease along rivers in Uganda also points to a chemical species that may have washed down the rivers from mining sites. The temporal clustering of the disease points to an event or conditions within the Internally-Displaced Persons (IDP) camp residence during conflict.

Associations and Possible Causes

Heavy metal toxicity can result in damaged or reduced mental and central nervous function, lower energy levels, and damage to vital organs. Long-term exposure may result in slowly progressive muscular and neurological degenerative processes similar to Alzheimer's Disease, Parkinson's Disease, Muscular Dystrophy, and Multiple Sclerosis.[8] Organophosphate poisoning, which can occur from pesticide or chemical weapon exposure, can manifest into lethargy, coma, and seizures. Organophosphate poisoning also suppresses the enzyme cholinesterase in the nervous system, which can cause illness in animals and humans.[9]

Previous research by the CDC examined *Ochocerca volvulus*, a parasite nematode (roundworm), as a potential cause of Nodding Syndrome. *Ochocerca volvulus* infection causes onchocerciasis, also known as river blindness. It is transmitted by the bite of the black fly found near rivers. There is an observed association between onchocerciasis and NS. An association with malnourishment has also been found with NS. Antibodies for *Ochocerca* were commonly found in children with Nodding Syndrome.[10]

However, in an interview with Dr. Opika Opoka, a pediatrician at Mulago National Referral Hospital who treated 24 NS cases transferred to Kampala, Dr. Opoka reported that only 3 cases had the antibodies for *Onchocerca* (April, 2012). This finding makes onchocerciasis a less likely cause of NS. Also, onchocerciasis is found throughout the world within populations of malnourished children. The association of onchocerciasis and NS seems non-causal, but related. The current treatment plan only subscribes sodium valproate for seizures with supplemental feeding and vitamin B6 doses.

Hypothesis

It is hypothesized that the cause of the disease is from a chemical or chemicals from pesticides, chemical weapons, or heavy metals from mining activity compounded with chronic nutritional deficiency in children. The chronic malnutrition from a poor diet exacerbates the effect of a yet to be identified chemical found in rivers and seasonal streams of endemic areas.

Angagura Health Centre. This is an average-sized health center in rural Uganda. ***Photo courtesy of Jason Oh.***

METHODS

This epidemiological surveillance was a prospective study among communities along the Aswa River, Pager River, and seasonal streams in the region that have a high prevalence of Nodding Syndrome. The CDC provided all sampling materials and the GPS unit. Environmental samples were collected for future analysis. GPS coordinates were marked for each sampling location for future reference of endemic regions.

Methodology Discussion

Conducted interviews were key informant interviews. Interviews with health workers were conducted to determine specific areas of high burden of NS, challenges faced at newly established Nodding Syndrome Treatment Centres, and any trends or findings. Interviews with families of children with NS were conducted for patient background, locations of water sources, and any other habits or behaviors that may have led to exposure. These interviews were informal fact-finding conversations without an established questionnaire. No recordings were made of the interviews for interviewee comfort, confidentiality, and to facilitate free-flow of information.

Environmental samples were collected in sterile plastic tubes for sample integrity. These were further placed by group in plastic biohazard bags for sample integrity and safety while handling. All bags were then placed in a foam refrigerator with cold ice packs to preserve the samples, some of which included fish. The ideal fish for sampling were predatory fish because toxicants in the water would be compounded through the food chain as larger fish ate the smaller fish. Therefore, concentrations of toxicants would then be higher in the larger predatory fish.

The GPS unit was used to accurately locate sample locations. This is more accurate than using maps or names of places, which may have been unreliable or not up to date. The GPS unit also located and named villages not found on maps for CDC records.

The other interviews and attendance of a Ministry of Health NS Task Force meeting were done to gather information on current institutional response and the current situation regarding NS intervention.

Obstacles encountered during the study included frequent power outages that made it difficult to maintain cold ice packs in the Gulu University Faculty of Medicine freezers before use in the field. This was overcome by rotating ice packs between the foam refrigerator and the freezers when possible. Another obstacle was the road conditions that required the rental of a 4x4 Toyota Land Cruiser. A final obstacle was the lack of fresh fish available for sampling. Fishing is not common in the region even though there are abundant fish in the rivers. Most fish that are eaten are imported from other parts of Uganda.

Top: Agogo River, a small tributary. Schistosomiasis, onchocersiasis (river blindness), and dracunculiasis (guinea worm) are parasitic infections still found throughout bodies of water in northern Uganda. Bottom: Aswa River. Bathing and washing is common. Drinking and cooking water is limited to borehole water. *Photo courtesy of Jason Oh.*

FINDINGS AND ANALYSIS

Sample of Findings

The Angagura Health Centre near the Bulobo and Kalawinya villages serves a population of approximately 15,600. There were 580 reported cases of Nodding Syndrome in this region. According to the nurse officer on duty, the health center had not received any training or treatment supplies for NS from the Ministry of Health as of April 13, 2012. It was reported that the Ministry of Health had visited on the 4th with promises to provide supplies and training. According to a local physician, the treatment plan being utilized at the health center was incorrect. The proper treatment plan is sodium valproate with supplemental feeding and vitamin B6 doses.

Aruu Falls Primary School in Lapaya Village of the Kawalinya parish had 173 enrolled pupils. There were 46 reported cases of students with NS, meaning that over 25 percent of the student body was affected. Water samples were collected from the boreholes for student drinking water. Students with NS were reported by a teacher to have low classroom performance, poor perception, diminished activity, and sometimes loss of consciousness. Another point to note is that exercise books of affected students were found to contain odd, but recurring similar handwriting. Some letters were found to be backwards as well. It was noted by the teacher that these students had normal handwriting before the onset of NS.

The Atanga Health Centre reported 640 cases of NS and admitted 13 in-patients that were not responding to treatment or had severe symptoms. Most cases were reported to be girls over the age of 5. Only 9 cases were reported under the age of 5. There were very few recent cases with the incidence clustering 6-8 years ago from IDP camps such as Pajule Camp. There was 1 new case from June 2011. The Health Centre had run out of supplementary feeding supplies and sodium valproate. It is the responsibility of the parents to feed and care for children with NS while they are admitted, but families often could not afford adequate sweaters or blankets. Distended bellies and open infected wounds sustained from nodding episodes were common.

The case of interest is a 15 year old male that attends Alune Primary School. The onset of NS was in 2006 while the male was in an IDP camp, and he was reportedly on medication since then (type of medication was unclear). Currently, he received medication from Pajimo Health Centre. The last episode of nodding occurred in January 2012.

Nodding Syndrome is a clinical constellation of symptoms that begins with head nodding and later results in progressive neurological deterioration.

The unique aspect of this case was that the patient appeared healthy. There was normal growth and he was responsive to questions, showing little to no mental degeneration. His diet was mainly dairy milk and vegetable greens. The milk came from the cows his family owns, which is traditionally a sign of wealth.

His younger brother also had NS and was 13 years old. The onset of NS occurred in 2008. Unlike his brother, this patient was not as tall. His growth was either slightly stunted or he had simply not grown that tall yet. He was also currently on medication.

Data Analysis and Inference

The 15 year old male in the case of interest offers a unique hypothesis to the cause of Nodding Syndrome. His normal growth and mental development could be attributed to a balanced diet of dairy milk, vegetable greens and seasonal fruit. The seasonal fruit would have been bought with money since no fruit trees were evident at the house. The potential for disposable income is evident from the ownership of cows. Cows are a traditional sign of wealth because they were used for large business transactions and dowries.

NS may also not necessarily stunt growth. It may just be a compounded effect with chronic malnutrition and the inability to eat food as well. This was inferred from the 15 year old male's normal height since dairy milk is high in calcium for growth.

The 13 year old brother may have stunted growth simply because the older sibling would most likely get the most food or best shares as typical of an Acholi household. The order of food taken from the communal area (usually on the ground in the middle of the seated family) and the choice of best shares are usually age and gender specific. The oldest adult male takes his share first followed by other adult males by age. Then, it is the adult females. Next, the oldest male child goes first followed by other male children by age. Finally, female children take their share by age.

This also could explain why NS is more prevalent in girls than boys and why onset is most common in younger children. Also, it is rare for very young children to be found with NS possibly because they are still nursing. Children in the region generally continue to nurse for a longer time than most Western children.

The drop in NS incidence in the past few years also correlates with people returning from IDP camps. This could be explained by better access to sufficient food and variety of food. The World Food Program noted that in 2004, most peo-

ple were not receiving enough food from emergency feeding programs to meet recommended caloric intake.[11] Today, the children are still living in a geographically defined risk area, but have a better nutrition status. Thus, the incidence rate may have been reduced these past few years.

The hypothesis created from these observations is that NS is caused by chronic severe malnutrition from a yet to be determined environmental trigger limited to a geographic location. This geographic location is near the Aswa and Pager Rivers in Kitgum and Pader Districts.

Overall, it was evident the national intervention on NS failed to adequately respond to the emergency. 580 cases of NS were mismanaged at one health centre. This health centre, without supplies or training for NS, serves a Primary School where 1 in 4 students has NS.

CONCLUSION

The Way Forward

There are a few further areas of research that can be pursued. The first is to shift the focus of investigation from onchocerciasis to chronic nutritional deficiencies. Following the case of interest, nutrition is worth investigating as a cause or predisposing condition for the cause of NS. Onchocerciasis is found across the world, so hundreds of thousands of children in these places should already have or be at risk for NS. A dietician should analyze nutrition profiles of children with NS compared to the unique case presented in this study and to healthy children in the region. The nutrition profile of an average child in the IDP camps during the conflict should also be considered as a factor for the temporal and geographic clustering of NS. The emergency feeding programs can be retrospectively evaluated by a dietician for nutritional profiles during encampment.

Another possible lead for further research is to collect predatory African lungfish during the wet season. Lungfish will emerge from their burrows and can easily be caught. They are found in the locations of sampling during this study. Lungfish are predatory and long-lived. Toxicants would be compounded as they eat other fish that live in the same waters. An autopsy could reveal traceable levels of toxicants and overall water conditions.

A large-scale case-control study of a few hundred students can be conducted immediately pending sufficient funding. Schools with high prevalence of NS can be used for the sample population. Blood, urine, and stool samples for a toxicological panel and extensive nutrition profile can all be collected at a central location, such as at a school. Records of time spent in IDP encampment, diet, and family situation can also be collected. All of these aspects of research would account for both the temporal and geographic clustering of NS.

Although there are many challenges with determining the etiology and cure for NS, the outlook for success is promising. These recommendations can serve as a start to overcome some of these challenges. The geographic and temporal clustering of NS incidence and prevalence offers topics to investigate to determine the cause of NS. Future projects would involve disease vector control after the etiology is understand. At the same time, cure development can be explored.

All of this research would help secure the future and stability of two regions recovering from years of violent conflict. Acholiland has successfully transitioned from the need of emergency response during and at the conclusion of violent conflict. However, Nodding Syndrome could jeopardize the transition to phases of reconstruction and development by harming the children and future of Uganda. Further exploratory research can effectively direct future public health interventions for maximum sustainable impact.

ACKNOWLEDGEMENTS

I would like to thank Dr. Scott Dowell, Director of the Division of Global Disease Detection and Emergency Response at the CDC Center for Global Health, for connecting me with CDC Uganda and allowing me to support their activities. I am very grateful for the direction and generous support Dr. Robert Downing of CDC Uganda provided me. This project could not have been completed without the resources Dr. Downing had provided. I want to also thank Dr. David Kitara Lagoro from the Gulu University Faculty of Medicine for his support.

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Amélie Nkodo | *Romance Languages and Literatures Major, Women, Gender & Sexuality Studies Minor, Class of 2014*

Addressing Malnutrition in Mobile Clinics in Tz'utujil Communities Surrounding Lake Atitlan, Guatemala

Health is a "crude concept", the site of philosophical speculation, as well as a dynamic experience.[1] How health is conceived and what socio-political forces influence the achievement of "good health" varies across the world. However, despite the variation of forces implicated in the definition and achievement of health, the field of global public health seeks to establish methods for transforming a seemingly incomprehensible concept into a reality in the lives of people around the world. The goal of attaining some form of health on a global scale calls for in-depth inquiry on how health takes form as an experience for individuals. Emphasizing the experience of health connects theoretical discourses of health as a concept to the reality of health and its effects on the lives of individuals. The experience of health takes into account not only the biological symptoms of health but also the interplay of the cultural, social, and political dimensions of the process. This emphasis served as a launching point for my research project on the Tz'utujil communities of Lake Atitlan, Guatemala during Summer 2012.

The experience of health takes into account not only the biological symptoms of health but also the interplay of the cultural, social, and political dimensions of the process.

Guatemala has the third highest level of chronic malnutrition in the world, behind Yemen and Afghanistan.[2] This ethnographic study attempts to understand the experience of malnutrition within individuals and how this problem is being addressed by the health-centered, non-governmental organization Volunteers Around the World (VAW) through its mobile medical clinics. Questions that arise are: How do families express the problem of malnutrition? What are the barriers of a doctor addressing malnutrition in a clinic? How does this form of healthcare address the specific needs of the communities that it visits? Therefore this study observes, evaluates, and analyzes the relationship between families and medical professionals. It serves to answer the inquiries: How do we go from thinking about health as a broad concept down to the specific problem of malnutrition? Given the multi-dimensional roots of this public health problem, what can be done within the confines of a mobile clinic?

HISTORICAL AND CONTEXTUAL BACKGROUND

The Republic of Guatemala is a Central American country bordered by Mexico and Belize to the north and El Salvador and Honduras at its southward border. Just over half of the population of the

One of three doctors on the mobile clinics observing the lake. ***Photo courtesy of Amelie Nkodo.***

A scene of Lake Atitlan. *Photo courtesy of Amelie Nkodo.*

country identifies as indigenous, the largest group being the Mayans. In total there are about 6 million Mayan people in Guatemala with 24 distinct ethnic dialects.[2] The Tz'utujil ethnic group is a branch of the Maya peoples, with Tz'utujil referring to both the people and the language. The Tz'utujil ethnic group is centered on Lake Atitlan in the midwestern region of the highlands.

Much of the country's landscape is dominated by volcanic uplands. The land has been described as "some of the world's richest and most productive soils." Today, one-half of the population of the country is employed in the agricultural sector and this sector accounts for one-fourth of the country's gross national product.[3] The "productive soils" of Guatemala's highlands have been particularly critical to the livelihood of its indigenous population. The Tz'utujil people have traditionally grown the staple crops of the region: maize, beans and squash.[4] Although the soil of the highlands continues to fuel much of the Guatemalan economy, social injustice and discrimination has excluded the majority of the indigenous population from economic rewards. Today, 2 percent of Guatemala's population own 70 percent of the productive farmlands.[5] Poverty and its accompaniments disproportionally affect the indigenous populations of Guatemala. According to the United Nations, 40 percent of indigenous people live in extreme poverty and 80 percent have little or no access to water, sewerage and electricity.[6]

According to the United Nations, 40 percent of indigenous people live in extreme poverty and 80 percent have little or no access to water, sewerage and electricity.

One repercussion of such abject poverty and lack of resources is higher levels of

malnutrition, particularly affecting children and women. As noted earlier, Guatemala has the third highest level of chronic malnutrition in the world; approximately 70 percent of indigenous children suffer from the condition.[7] This extreme level of malnutrition and the lack of health services have propelled international organizations such as Volunteers Around the World (VAW) to set up medical missions throughout the Highlands of Guatemala. The VAW doctors in these mobile clinics are often the only source of healthcare for the local population.

Chronic malnutrition is seriously detrimental to child development.

A SCENE FROM THE CLINIC

I shadowed Dr. Marcos at the first community in which the volunteers and I set up a mobile clinic. A woman came with her three children. She indicated that she was concerned about her eldest child, her daughter of about six years old, because the child's hair did not grow properly.

Dr. Marcos: "Doña, tell me what is wrong?"

Mother: "Her hair won't grow. It starts for a little bit and then it breaks, look."

Her daughter looked at us and turned around for us to see. She had a very thin ponytail and patches of hair. The doctor determined that this was due to malnutrition. Her mother listed all the food products she had eaten, and noted that she did not know what to do anymore. The doctor wrote a prescription for thirty days of children's vitamins (supplied by the VAW clinics) and recommended foods that could help alleviate the problem.

CONCLUSIONS AND SIGNIFICANCE

By the last day I had noticed a pattern throughout all of the clinics. The majority of people who came in to be examined were women with their children. Many women complained of stomach pains that all the doctors identified as gastritis, an inflammation of the lining of the stomach. They recommended that the women avoid eating chili, coca-cola and other acidic foods and incorporate more neutralizing fruits like papaya into their diets. Because the doctors were aware that good nutrition began with a healthy diet, the doctors always made sure to ask patients about their diets and to give food recommendations for the families. What struck me as interesting about these recommendations was that these medical professionals believed that the families were eating the wrong kinds of foods because of a lack of nutrition education rather than a lack of access to healthy foods.

Chronic malnutrition is seriously detrimental to child development. Malnutrition reduces the ability of the body to appropriately grow in height and develop motor skills.[8] Stunting is usually a process that begins *in utero* and develops quickly due to lack of nutrients and childhood infections. Within the department of Sololá, in which the communities targeted by VAW are located, in 2008, 64 percent of preschool children exhibited low height-for-age as well as 65.2 percent of school children, well above the national average of 45.6 percent. Stunting has been correlated with lower achievements in school during childhood.[9] The repercussions of under-nutrition also expand into the adult life of affected children, as stunting is correlated with lowered economic productivity.[8]

In order to better address the health needs of these communities in the highlands of Guatemala, VAW needs to refocus some of its attention to access to healthy foods, which may not be possible through its mobile clinics. Addressing health solely through a mobile clinic isolates the problem of malnutrition from its root societal causes. It is important that we view malnutrition as a long-term, public health crisis that can adversely affect human development over an entire lifespan.

ACKNOWLEDGEMENTS

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Survival Rate of FNR-Mutated *Salmonella enterica* Serovar Typhimurium in Soil

ABSTRACT

Introduction

After the discovery of a mutation of the FNR protein in *Salmonella enterica* serovar Typhimurium that caused the loss of the bacteria's virulence, the goal of studying the environmental toxicology of the mutation was set. After creating a valid live-bacterial vaccine for poultry, it was seen that the *FNR* strain was still being excreted in chicken waste and carried throughout the soil to other farming plots. Foods harvested from these lands are often eaten raw, and therefore could potentially cause health concerns in humans. In order to prevent this from occurring, survival rates of *FNR Salmonella enterica* serovar Typhyimurium were researched.

Materials and Methods

250g of North Carolina Piedmont soil was used in both control (*Salmonella enterica* serovar Typhimurium without the FNR mutation or *ST*) and *FNR* experimental beakers. A total volume of 25 mL of phosphate buffered saline (PBS) and bacteria was added to sterilized soil to yield a final cell concentration of ~10^8 to 10^9 CFU per gram of soil for both the *FNR* and *ST*. Each day, serial dilutions of the soil were plated onto XLT4 Agar plates and cell counts were taken after 24 hours of incubation at 37.4° C using 1g of soil per beaker and PBS. Results: Samples were taken for a span of 34 days. *FNR* levels in soil decreased slightly faster throughout the experiment than *ST* levels with a slope of -0.3773 as opposed to *ST*'s slope of -0.3227. The *FNR* population showed a six cycle decrease, whereas *ST* showed a four cycle decline.

Conclusion

Day 34 marked when *FNR* was no longer countable on the lowest cell plate of 10^{-1}. *FNR* dropped from $2.40x10^8$ cells per gram of soil at day 0 to less than 1.5×10^2 cells per gram of soil at day 34. The *ST* population dropped from $8.30x10^7$ cells per gram of soil at day 0 to $4.2x10^3$ cells per gram of soil at day 34. With a greater than 6 log decrease in 34 days, *FNR* data shows that 99.999% of the inoculated bacteria will be gone in just over one month. Future testing should be performed to note how *FNR* would react with other bacteria and fungi that are normally observed in soil and chicken feces.

INTRODUCTION

Each year, there are approximately 40,000 cases of Salmonellosis reported in the United States. Out of these, there is an estimated 400 deaths attributed to acute salmonella poisoning.[1] The most common of these strains, *Salmonella enterica* serovar Typhimurium, is a gram-negative intracellular pathogenic bacteria that, when ingested, causes gastroenteritis. As immunocompromised populations are the most susceptible to its effects, this foodborne infection poses a fatal risk to both the elderly and young children. Thus, it is vital that progress be made in reducing Salmonellosis outbreaks from occurring in livestock and agricultural products.

Recent research has indicated that the FNR Protein in *salmonella enterica* serovar Typhimurium is fundamental in not only O_2 sensing, but also in the regulation of the virulence operon (srfABC), motility, flagellar biosynthesis, and pathogenesis. The *FNR* mutant strain when administered proved to be attenuated in mice.[2] Within the next 10 years, the goal is to use the mutant Salmonella as a live-bacterial vaccine for poultry. Because *FNR Salmonella Enterica* does not survive in macrophages, the mutant will give a chicken's immune system a chance to characterize the bacteria and protect itself from future infection. Although this will potentially lessen the *direct* human exposure of *Salmonella enterica* serovar Typhimurium, the *FNR*-mutated strain will still pass through the chicken's digestive system and into the soil. Many farmers use an-

imal waste as a fertilizer for other crops that can be eaten raw, thus exposing humans to the *FNR*-mutated Salmonella. Although the vaccine strain is expected to be non-virulant to humans, the presence of this strain will test positive for Salmonella in food samples. In addition, it is necessary to determine the rate of survival of the *FNR*-mutated bacteria in the soil in order to determine the impact of this potential vaccine strain on the environment. This will also help establish the minimum time required following the application of the animal waste to soil before the land can be used for planting different crops.

MATERIALS AND METHODS

Inoculation

Two 500ml glass beakers were used to separately house *ST* and *FNR*-mutated *Salmonella enterica*. Each strain was placed in 250g of North Carolina Piedmont soil that was sifted of all roots and debris. Each beaker was then autoclaved for 60 minutes under the solid setting. The soil was confirmed sterile and contained no interfering microorganisms.

There was an aimed initial bacterial concentration of 1.0 x 10^9 cells per 1g of soil. In order to achieve this, both *FNR* and *ST* bacteria were cultured overnight in liquid LB media. Both samples were subsequently centrifuged at 12,000 x g for 10 minutes and cell pellets were re-suspended and washed twice in 20 ml of PBS. Optical Density of the cell suspensions were determined using a spectrophotometer at $O.D._{600}$ nm and were used to determine bacterial concentration per 1mL of culture (one unit $O.D._{600}$ = 1.7 x 10^9 CFU/mL). A calculated volume of this suspension was used in a total volume of 25 ml of PBS and added to 250g of sterile soil to yield a final cell concentration ~10^8 to 10^9 CFU per gram of soil for both the *FNR* and *ST*. The soils were then each mixed thoroughly for 10 minutes using sterile tongue depressors and covered with parafilm. Small openings were then created in the parafilm to allow for oxygen exchange. The inoculations took place inside a laminal-flow hood and samples were kept inside the hood throughout the duration of the experiment.

Viable Cell Counts

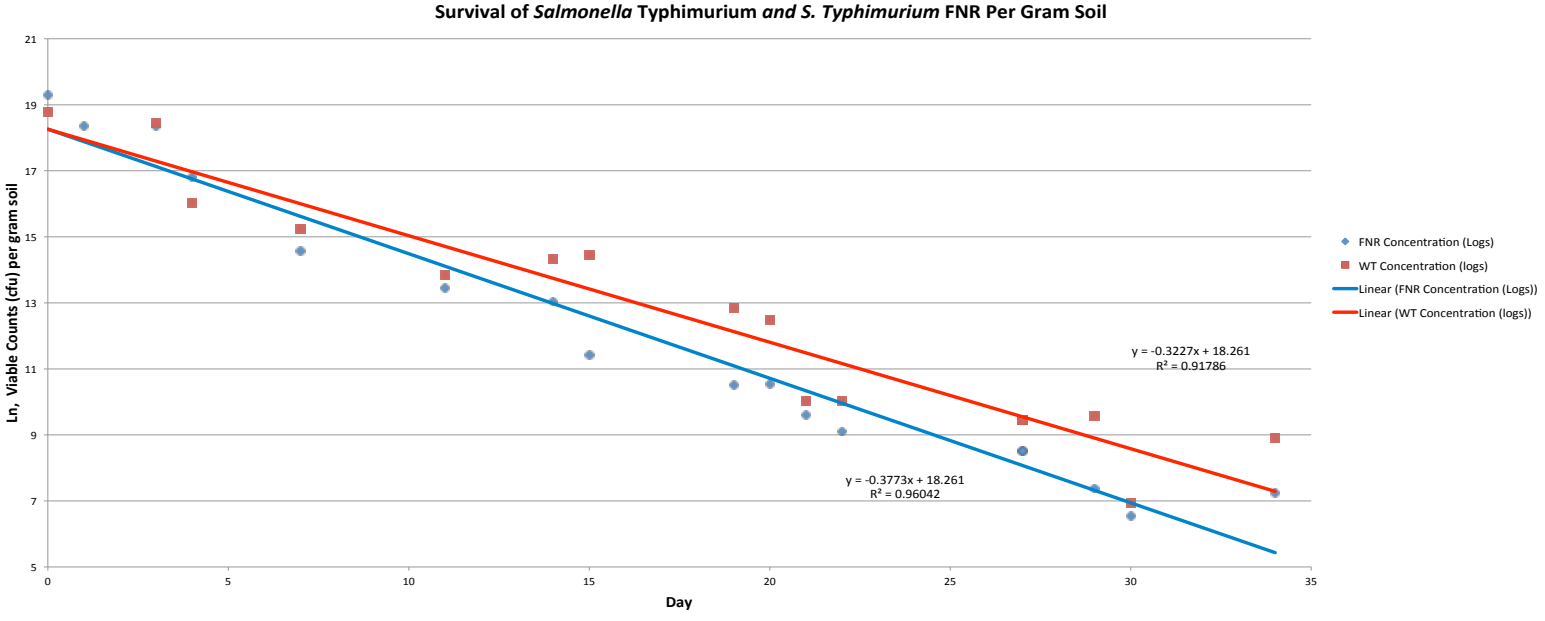
In order to determine bacterial counts (CFU/ g of soil) to create death curves for both strains, approximately 1g of soil was plated each day from both beakers. The samples from each beaker were weighed and diluted to a 1:10 soil to PBS ratio. Serial dilutions of the samples were plated accordingly onto XLT4 media. The plates were incubated for approximately 24 hours at 37.4°C incubator before they were counted.

A very precise procedure was followed to collect the soil samples and determine the water loss (water vapor) during the duration of the experiment. First, the beaker was weighed, then uncovered of parafilm. Using a sterile tongue depressor, the soil was scraped from the bottom of the beaker and aerated slightly. A new piece of parafilm was then used over the top and the entire beaker was inverted for 1-3 minutes to thoroughly mix soil. All non-sterile parafilm was disposed of daily as were the tongue depressors used to collect roughly 1g of soil. The soil samples were not corrected for water loss due to moisture loss only reaching between 1-2% of soil weight.

RESULTS AND CONCLUSION

Samples were taken for a span of 34 days. The moisture content in the soil was measured at 9% in each beaker at day 0. Assuming approximately 1.5g of soil was lost

Figure 1. The death rates of both *FNR* and *ST* through the experiment period is shown. Approximate 1g samples were taken and viable counts were determined. Inset represents the percent surviving of the *FNR* and *ST* populations over time.



while sampling each time, *FNR* Moisture loss at day 30 is estimated to be 1.01% of the soil weight. *ST* Moisture loss at day 30 is estimated at 2.69% of soil weight. During the experimental period, both *ST* and *FNR* populations diminished at similar rates. However, the *FNR* mutated Salmonella deceased slightly faster throughout the experiment than the *ST* with a slope of -0.3773 as opposed to *ST*'s slope of -0.3227. As shown in the inset of the graph below, the *FNR* Salmonella population shows a six cycle decrease, whereas *ST* only shows a four cycle decline.

By day 34 of the sampling period, it was found that plates were not countable for *FNR Salmonella enterica* serovar Typhimurium at even the lowest dilution plated, 10^{-1}. This indicated that the bacterial population of *FNR* dropped from $2.40x10^{8}$ cells per 1g of soil at day 0 to less than 150 cells per gram (i.e., 1.5×10^{2}), which is >6 log reduction. The *ST* population dropped from $8.30x10^{7}$ cells per 1g of soil at day 0 to $4.2x10^{3}$ cells at day 34. This shows only a 4 log reduction as opposed to *FNR* mutant's >6. Although most soil will be purged of bacteria before being sold as fertilizer, this study shows that within approximately one month of being collected and stored, the soil will have 99.9999% of the *FNR Salmonella enterica* serovar Typhimurium gone from the original population, whereas only 99.99% of the *ST* would have died. This demonstrates a significant difference in prevalence of *FNR* bacteria after soil exposure and suggests the live-bacterial vaccine for this mutant strain is a viable option for poultry farming.

It has been shown that the FNR mutation forces the bacteria to become non-motile, lack flagella, and be unable to survive in macrophages.[2] It is hypothesized that the faster rate of decline that was observed in *FNR* Salmonella compared to *ST* was due to a lack of normal defense and survival portions of the bacteria that are present in the control. Now that a proper survival rate has been found for *FNR* Salmonella, future testing should focus on how FNR would react in soil with other bacteria and fungi that are normally observed in soil and chicken feces.

These findings suggest that the *FNR* strain is a feasible candidate for live-bacterial vaccinations in poultry, as any toxicological effects of the inoculation would no longer exist in the soil after just over a month's time. Because of the increasing growth of the *agribusiness* throughout North America, poultry farming will only become a larger facet of the consumer market in upcoming years. From a public health standpoint, the amount of foodborne illness and death stemming from poultry is a major concern that must be properly and promptly managed. Through the development of inexpensive, broad-range vaccinations for the origins of these diseases, we can decrease fatalities, improve overall population health, and prevent future outbreaks from occurring.

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HISTORICAL PERSPECTIVE

Salmonella is a motile bacteria responsible for 400 deaths in the US every year. The bacteria commonly infects humans when ingested in a large quantity, usually from uncooked foods, and leads to symptoms of diarrhea and fever due to the host's immune response to the infection. Infections are especially dangerous to HIV-infected and immuno-compromised individuals. In the United States, the most recent, serious outbreak of infections came in 2008 when a vegetable source was responsible for over 1,000 infections. Salmonella can live for weeks outside of a host, which is why it is commonly transferred from livestock to vegetables, surviving in the fertilizer. Although it is transmitted by many different food sources, eggs are the most common source of infection. One of the main solutions proposed in the United States has been to mandate the vaccination of egg-laying hens. England began vaccination trials of hens in 1998, and there has been a consistent decline in infections ever since. The success has led many US farmers to inoculate their own stocks in recent years. Researchers have aimed to produce a more effective vaccine over the last decade, however, such as the *FNR* mutant strain of Salmonella discussed in the paper.

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Sedentary Behavior and its Relation to Physical and Emotional Functioning

THEN AND NOW

Fifty years ago, measurement of physical activity was based on recall, leading to inaccurate data. With the invention of accelerometry, accurate data on the intensity and duration of participants' physical activity could be obtained. Likewise, with the advent of the Sensecam, a wearable camera that takes pictures automatically every twenty seconds, more accurate data on participants' daily activities are able to be retrieved and matched with physical activity or sedentary behavior. Accurate assessment allows us to have more confidence in relating behaviors to health outcomes.

INTRODUCTION

The number of older 0adults is increasing and is projected to rise from 35 million in 2000 to 72 million by 2030, accounting for 20 percent of the total U.S. population.[1] Health care costs are greatest in older adults[1] so it is crucial to focus on improving this population's health to minimize costs. The majority of older adults spend a large amount of time being sedentary.[2] Sedentary behavior has been defined as "*any activity that does not increase energy expenditure substantially above a resting level including behaviors such as sleeping, sitting, and lying down.*"[3] Studies have shown that individuals can be both sedentary and physically active in a given day; for example, someone could go for a walk in the morning and meet physical activity guidelines (thirty minutes of activity per day), but then spend the rest of the day sitting. Therefore sedentary behavior is not simply the inverse of physical activity. The relationship between sedentary behavior and poor health has been shown to be independent of physical activity, meaning that sedentary behavior is detrimental even if one is meeting physical activity guidelines. Specifically, sedentary behavior has been related to disease risk, weight gain, type 2 diabetes, cardio metabolic risk, specific cancers, cardiovascular diseases, all-cause mortality and cardiovascular mortality[4] and lower physical functioning.[5] Although physical activity has been shown to be related to both physical and emotional functioning and studies have examined how sedentary behavior is related to physical functioning, few studies have investigated whether sedentary behavior is independently related to emotional functioning.

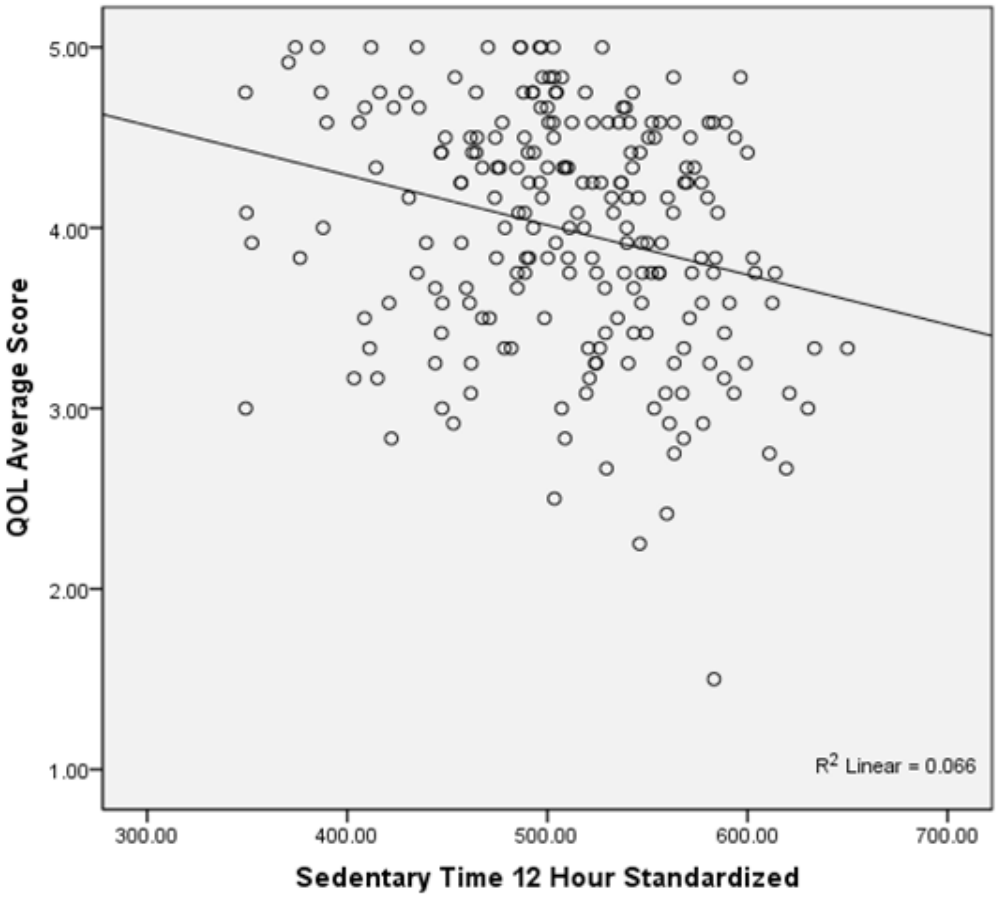
Sedentary behavior may be related to depression and emotional functioning through the absence of the physiological mechanism present in the relationship between physical activity and depression or through other processes still under investigation. It is also not clear whether all sedentary behaviors exclude positive psychological experiences. For example, card playing in older adults involves sitting, but it is a social experience and an enjoyable diversion that involves skill mastery.

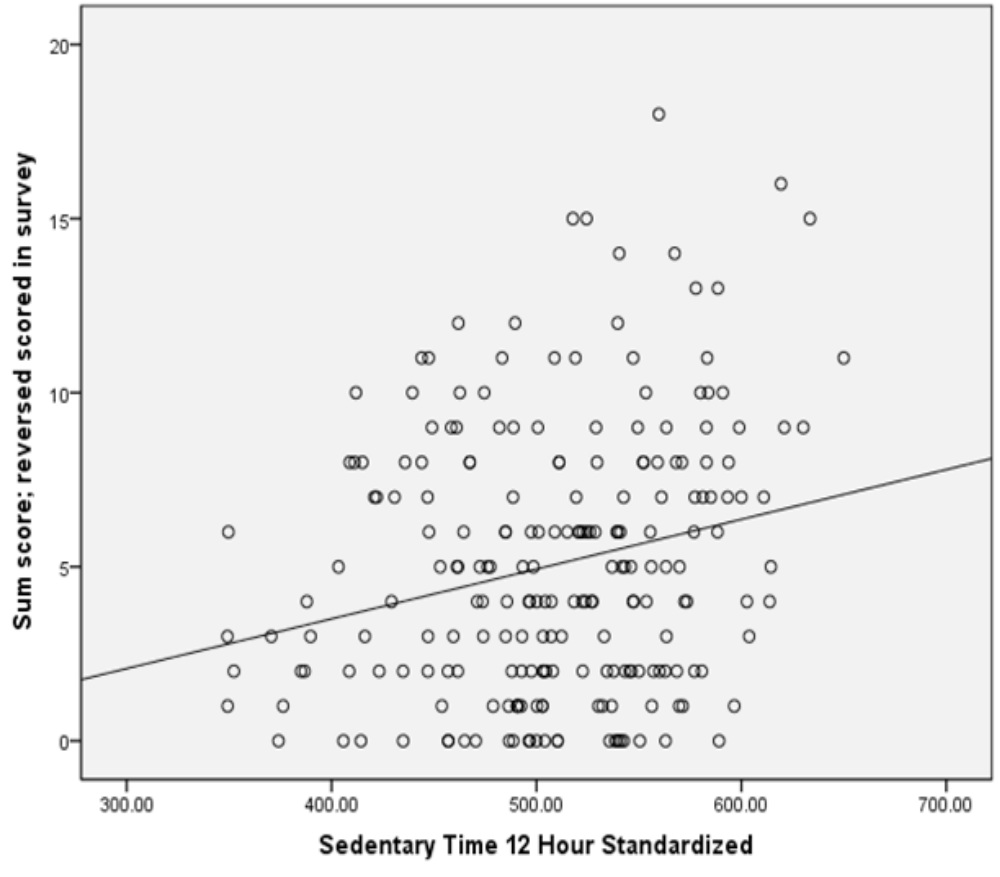
While sedentary behavior clearly affects physical functioning, we seek to investigate whether or not it has any correlation or relationship to emotional functioning (depression, quality of life, etc.) The objectives of this article are to examine the relationship between sedentary behavior and physical and emotional functioning.

METHODS

Study participants were Continuing Care Retirement Communities (CCRC) residents aged 65 years and above. Only baseline data were employed in these analyses. Eligibility criteria included: ability to speak and read English, ability to complete written assessments, ability to provide informed consent, no history of falls within the past 12 months that resulted in hospitalization, ability to walk 20 meters without human assistance, completion of the Timed Up & Go Test in less than 30 seconds, ability to read survey questions, and completion of a post-consent comprehension test. Recruitment strategies were site-specific and included the use of flyers, presentations, participant testimonials from previous sites, and encouragement from site staff and peers.

Sedentary behavior was measured objectively with the Actigraph (model GT3X+) accelerometer. Participants wore the accelerometer on their waist during waking hours for 6 days. A "valid day" was at least 10 valid hours of wear. Non-wear time was defined as 90-plus consec-





utive counts of zero with a two minute tolerance. Participants were asked to re-wear the accelerometer if <4 valid days or a minimum of 600 valid minutes across 4 days was observed. The threshold used to measure sedentary activity was <100 counts/min on the accelerometer. The average sedentary time per day was standardized for all participants to 12 hour day to adjust for differences in wear time (12 x min/hr sedentary rate.)

The average *Moderate to Vigorous Physical Activity* (MVPA) time per day was also measured using an accelerometer. To adjust for MVPA in the analyses we grouped participants according to whether they met the guidelines of 30 minutes of MVPA per day. The threshold for MVPA was ≥ 1,952 counts/min.[6] *Physical functioning* (PF) was measured in three ways using objective and self-reported measures: Functional performance was measured with the *Short Physical Performance Battery* (SPPB.)[7] The SPPB evaluated balance, gait, strength, and endurance by examining ability to stand with the feet together in the side-by-side, semi-tandem, tandem, and single leg stance positions; time to walk 8 feet at a normal pace; and time to rise from a chair and return to the seated position 5 times as quickly as possible with arms crossed.

The *400 Meter Walk Test* [8] assessed cardiovascular fitness through timing in seconds how quickly participants could walk the 400 meter indoor course. Participants were instructed to walk 16 laps around a 25 meter indoor course quickly while remaining safe.

The *Late Life Functioning Disability Instrument* (LLFDI)[9] was used to determine self–reported functional performance and physical disability. The survey asked participants to rate their difficulty in performing various tasks (walking a mile, getting in and out of a car, etc.)

Quality of life was measured with a

Top: Sedentary Behavior inversely related to Quality of Life. Bottom: Sedentary Behavior positively correlated to depression.

subset of the Perceived Quality of Life Scale (PQOL.)[10] Items included are satisfaction with: physical health, caring for yourself, thinking and remembering, walking, getting outside, carrying on conversation, seeing and talking to friends, helping family and friends, contributing to the community, recreation and leisure time, respect from others, and meaning and purpose in life.

Depressive symptoms: Self- report surveys measured depression on the Center for Epidemiological Self-Reported Depression (CESD) depressive symptoms scale.[11] Participants ranked how they felt or behaved during the past week (fearful, lonely, hopeful, etc.)

Linear regression models were employed with sedentary time per day as the independent variable and a different model was employed for each of the five physical and emotional functioning outcomes (SPPB, 400 Meter Walk Test, LLFDI, PQOL, and CESD.) The analyses adjusted for gender, age, and meeting the MVPA guidelines in order to test whether the relationship between sedentary behavior and emotional and physical functioning was independent of physical activity.

RESULTS

A total of 229 participants (average age of 84) were assessed; 30 percent were male and 70 percent female. Minutes spent in sedentary behavior per day was significantly negatively correlated with physical functioning measured by the SPPB [t = -4.374 and P <.0001] and LLFDI [t = -4.913 and P < .0001]. Sedentary minutes were also inversely related to quality of life [t = -2.428 and P =.016] and positively related to depressive symptoms [t = 3.250 and P < .001].

DISCUSSION

This study producing interesting preliminary findings, where results suggested a positive relationship between sedentary behavior and depression. However, further research is needed to develop a conclusive statement about the validity of the relationship; more findings need to be replicated cross-sectionally and across different age groups. In addition, prospective long term studies and interventions need to be conducted in order to safely conclude that prolonged sedentary time leads to lower quality of life and higher levels of depression.

Our results suggested that in older adults, sedentary behavior is negatively related to quality of life and positively related to depression.

CONCLUSION

This study was one of the first studies in this age group to reveal the relationship between sedentary time and physical and emotional functioning. Our results suggested that in older adults, sedentary behavior is negatively related to quality of life and positively related to depression. Other studies found similar results showing the correlation between higher levels of sedentary behavior with an increased risk of depression in adults. [12] Since sedentary behavior is independent from physical activity, i.e. you can be both highly active and highly sedentary during a day. It is vital to assess both sedentary time and activity time and relate it to mental health outcomes, to see if there are additive effects (e.g. if individuals who are highly sedentary and not active have worse outcomes than those who are both highly sedentary and highly active.) For older adults, some sedentary behaviors like playing cards may be beneficial for mental health, so it is important to investigate for behaviors in which the physiological effect of being inactive is stronger than the psychological.

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PR

INCIPLES & POLICIES

The silent way home | Chromepet, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

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Ensuring Quality By Supporting Maryland's Nursing Population

The 2.7 million nurses in the United States[1] are essential for ensuring consistent, high quality health care and successful patient outcomes. As reimbursements are becoming increasingly tied to readmission rates and other patient outcome quality measures, the role of the nurse is evermore important in the national health care arena. Nurses are the first line of defense against hospital acquired infections, patient falls and other avoidable incidences that result in poor patient outcomes. Despite their importance, the population of certified nurses in the U.S. is subject to extreme fluctuations depending on the concurrent economic climate. Additionally, the United States is on the brink of a huge shortage of nurse leaders and educators that has been coined the "Silver Tsunami," as the majority of nurses filling leadership and educational positions are quickly approaching retirement age.

The state of Maryland has created Nursing Support Programs I (NSP I) and II (NSP II) to regulate the nursing supply pipeline. Over the 2011-2012 academic year, I interned with the Maryland Health Services Cost Review Commission (HSCRC), the state agency that oversees NSP I and II. I worked to evaluate the effectiveness of these programs as they came up for renewal in July 2012. At the HSCRC, I learned not only of the extreme importance of regulating the nurse labor supply, but I was also exposed to the unique payer system that was created by the Maryland HSCRC. This system connects hospital executives with state agencies, allowing collaboration between private and public health care actors so that hospitals profit while state needs are met.

The nurse labor supply poses challenges to health care systems because it is counter-cyclic. When the economy is prospering and hospitals are in a position to expand, there tends to be a shortage of nurses despite a high demand for them. When there is an economic downturn, as in the recent recession, there tends to be a glut of nurses even though hospitals and other health care providers are not in a position to hire new staff. This is because nurses are often the secondary income providers in a family. Seven out of ten nurses are married women. This demographic is more likely to enter the labor force when financial resources are strained and leave the workforce during times of financial stability.[2]

The nurse labor supply also poses challenges to health care systems because nurses have one of the highest attrition rates among any career field. Nurse turnover rates average around 14% in a 2011 study.[3] A large influx of new nurses does not guarantee a long-term boost in the nursing workforce. Nursing is difficult; Long hours, unpleasant working conditions, and lack of respect are frequently cited as reasons for this high rate of departure from the field. While surely there are many contributing factors, one important reason that is often overlooked is that many new nurses receive little to no support in transitioning from the role of a nursing student to that of a full-fledged independent nurse. Unlike medical students who have up to four years of fellowships, nursing students can enter the workplace immediately after receiving their diploma. This quick transition attributes to 30% of newly graduated nurses leaving their position in their first year alone.[4] The average cost of producing a nurse is $82,000.[5] This represents a huge loss on investment, so the HSCRC is taking steps to retain nurses during the crucial first few years of their career.

NSP I allocated $17.7 million to Maryland hospitals to create or maintain preceptor programs and mentoring networks to ease new nurses into the work place. Several hospitals in Maryland, such as MedStar Good Samaritan in Baltimore, have created extensive mentoring and transition programs with this funding. Additionally, NSP I in concord with NSP II funds individual educational scholarships for nurse educators, encourages nurses to continue their education in the form of specialty certifications and advanced nursing degrees. Hospitals like Bon Secours in West Baltimore have produced advanced nurse specialists in wound care, an investment that has reaped huge improvements in patient outcomes. Advanced degree nurses are also more likely to remain in the work force and can serve as educators, mentors, and role models to new nurses, further reinforcing a support network.

Continued nurse education is particularly important. However, the population of nurse educators in this country is rapidly aging. The average age of a nurse educator in the US is 55.[6] This phenomenon has been termed the "Silver Tsunami." If these nurse leaders retire without proper replacements, we will be left with almost no educators, leaders or role models within the nursing practice. This impending loss coupled with the expected fluctuations in nursing staff could pose a

huge threat to any state's health care infrastructure. Programs like NSP I and II are crucial for avoiding this shortage.

NSP I and II are just one of many creative solutions thought up by the HSCRC. The agency was established in 1971 to directly regulate hospital rates paid by private insurers, Medicare, and Medicaid. The rates are influenced by variables like quality of care provided and the number of uninsured served. In other states, each hospital negotiates prices with individual payers rather than paying by a state regulated price structure. Maryland's system has been hugely successful for reducing hospital cost in the state. The rate of increase for cost adjusted hospital admissions between 1977 and 2009 was the lowest in the nation. In the 2009 fiscal year, the national average increase in cost for a hospital adjusted admission was 4.5% whereasMaryland only experienced a 2% increase.

Hospital administrators and state rate setters meet on a regular basis to discuss each other's needs and adjust the system so those needs are met. This collaboration sets the groundwork for tackling issues like inter-hospital readmission rates, the cost of uninsured patients, and statewide nursing shortages. Coordination has been a key word in this time of change in our national healthcare system. The HSCRC's culture of coordination between private and public can serve as a model as we move forward at the national level.

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The birth of health disparities | Institute of Child Health & Government Hospital for Children | Egmore, Chennai, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Rachel Witkin | *Global Environmental Change and Sustainability & Writing Seminars, Class of 2014*

Chromium Exists Underground in Turners Station Community

About 30 members of the Turner Station Conservation Teams in Dundalk, MD are gathered in a small classroom at a local high school to talk about projects to restore their community at their monthly meeting on February 27, 2012. Steve Stewart, who represents the Bear Creek/ Old Bay Small Watershed Action Plan, has just discussed the need to clean up Bear Creek. A man raises his hand, asking the speaker if it would have been okay to eat the fish his neighbor had caught. Stewart tells him no, as the fish was probably saturated with the mercury concentrated in the sediments of the creek. The group muses about what Dundalk was like 40 years ago when they were children. There used to be a beach by the waterways that led into the Chesapeake Bay. Now there is only a warning sign telling residents that they are not allowed to swim or fish in their water.

"They dumped it, paved it, and forgot about it," Rule said.

"The Clean Water Act doesn't seem to exist in this area," Vice President of the Turners Station Conservation Teams Gloria E. Nelson said to the group.

The citizens of Turners Station, a historically African-American community, live with the consequences of Baltimore's crumbling industry. The small town is surrounded by Dundalk Port, which is the main port of Baltimore, Sparrows Point, and Riverside Power Plant. Sparrows Point is a steel community. However, since the steel industry collapsed, the land has changed four times in the past decade. A Russian steel corporation now owns the mill. According to Professor Ana Rule of Johns Hopkins Bloomberg School of Public Health, every time land ownership changes, all of the environmental concerns of the community should be addressed and problems should be remediated. However, this does not always occur.

Riverside Power Plant is south of Turners Station. According to Rule, it produced one ton of sulfur dioxide, 76 tons of nitrogen oxides and 19,763 tons of carbon dioxide in 2007. In 2003, 752,000 gallons of number 2 fuel oil, 240,000 gallons of kerosene and 125,000 cubic feet of natural gas were released from the power plant. Wagner's Point is a brownfield surrounded by industry. Because the community had an excess number of cancer cases, it was declared non-viable by Baltimore City, according to Rule.

To make matters worse, Turners Station residents also live on top of a chromium dump. Baltimore used to be one of the biggest chromium producers in the nation, but its processing plant, Allied Chemical, shut down in 1985 along with most of Baltimore's industry. When the plant closed, scientists realized that when the terminal had or wanted to expand, the company had used chromium ore processing residue (COPR) from the Allied Chemical Company to expand the terminal by 148 acres and to fill the marshy bay land, according to Rule.

"They dumped it, paved it, and forgot about it," Rule said.

Chromium exists in two forms, trivalent and hexavalent. The trivalent form is not toxic because living organisms cannot absorb it. However, if it is in the hexavalent form, humans can absorb it very easily. COPR is a hexavalent form of chromium, which is a known cancer-causing chemical that can harm the fragile organisms living in the Chesapeake Bay area.

Rule is concerned because the extension to the terminal is paved over, but it is not sufficiently sealed. This means that the water, soil and air have the potential to be exposed to the chemical. No one knows exactly where the chromium was deposited or how much there was. The Maryland Department of the Environment (MDE) has been working for the past 7-10 years to figure out precisely where the COPR is and what risks it poses, according to Ann Carroll, a member of the EPA.

"There's a lot of effort made to try to do a better job delineating the extent of contamination out there, where exactly the COPR material had been used and whether or not that material was covered," MDE Program Administrator James Carroll said.

According to Rule, the company who now owns the terminal, Honeywell, performed a study to respond to a lawsuit from the community. Honeywell concluded that the chromium was covered and buried too deep to have an effect on the people in the community. They also conducted a corrective measures analysis report with the Port Administration that they presented to the public last year.

Honeywell presented three times at this community meeting to explain what they are doing to address the chromium.

The daily view of Lake Atitlan during the journey to the volunteer sites. ***Photo courtesy of Amelie Nkodo.***

Their first plan is to take "no further action," though they have already done some work, such as treating and monitoring groundwater and taking "protective measures for workers and the community." These measures are not outlined on their website. The second alternative, called "Basic Containment," would be for the company to maintain the blacktop chromium cover and to monitor drinking water at the site itself. The third alternative includes both of these alternatives, but adds the "relining of storm drains" and a program that would monitor the stormwater, groundwater, blacktop surfaces, and the chromium itself. This approach focuses on preventing the contaminated water from entering the drains instead of mitigating the already contaminated drains. The fourth alternative would excavate the site and dispose 130 acres, or 35 percent, of the chromium. During this removal, the company would have to manage groundwater and stormwater and also remove and replace the storm drains. The Honeywell website notes that, "if partial excavation were to occur, there would be an economic impact of the Port threatening several hundred jobs over a seven-year period, as well as a potential effect on local communities." The last alternative is a "full excavation" of the site, which would dispose of 148 acres of chromium and groundwater. This would threaten "several hundred jobs over a 10-year period."[1]

This plan was also sent to the MDE for approval. "We've reviewed it. We're going to have some comments and then send the letter back," Carroll said.

When asked about current actions that Honeywell is taking, a company representative Connie DeJuliis, pointed to the Baltimore Chromium Residue Cleanup website, which states the five alternatives mentioned above. She did not respond to any further email inquiries as to whether or not Honeywell is currently doing anything about the COPR.

While Honeywell is working towards implementing these programs, Rule notes that Honeywell employs most of the community. The community members obviously need jobs to survive, but by working for Honeywell are toxic chemicals slowly poisoning them?

"Part of the problem is that they employ 80 percent of the people of Turners Station," Rule said. "I don't know if we want to close the terminals, but we would

like the remediation to be done."

Additionally, Rule does not think that the chromium is only in the groundwater. She says that the chromium is actually coming up towards the surface, which means that it is not as deep as Honeywell claims. The company only did tests on the inside of the terminal. Rule wants to start a project to measure the concentration of chromium in the air of the community.

The community members obviously need jobs to survive, but by working for Honeywell are toxic chemicals slowly poisoning them?

If she does find sufficient amounts of chromium in the air, it may explain some of the health problems in the area. The Occupational Safety and Health Administration (OSHA) states that exposure to hexavalent chromium at work can cause lung cancer, irritation or damage to the nose, throat, and lung, and even damage to the skin and eyes if it is breathed in at high concentrations.[2] However, this government organization only concerns the workers and does not discuss the effect the chromium air exposure has on the rest of the community. The people of Turners Station are forced to breathe this possibly poisonous air all day, every day.

The Honeywell study also focuses only on the workday and not the permanent conditions of the residents of the community. Samples taken at the terminal show that the amount of chromium in the air does not exceed the OSHA regulations. OSHA states that workers cannot be exposed to an average of 0.5 micrograms per cubic meter of air.[3] The EPA regulations for community members state that they cannot be exposed to an average of 0.1 micrograms per cubic meter of air.[4] This means that the working regulations allow for five times more chromium than the community regulations. Since no community studies have been done, there is no way to know currently how much chromium is actually in the air and how it is affecting the people who live around the terminal.

Carroll does not think that the chromium is a serious health problem that residents should be concerned about because it is buried under asphalt.

"Those metals would have negative health effects on people, but you have to be exposed to it," he said. "At this juncture, we know that the COPR material has been buried underneath. If people aren't exposed to it, then there won't be any health impacts."

Rule does not know what the exact rate of diseases such as cancer is in Turner's Point because she does not study epidemiology, which would give her the ability to gather health statistics on the area.

"I've talked to some epidemiologists," she said. "There are too few community members [in Turners Station] in order to establish for certain if you have a higher or lower rate [of cancer]. You need a big enough population. I don't know if I buy that, but I haven't found anybody that's interested in looking at it."

Rule thinks that she would be able to get more information if Turners Station was a bigger community. For now, there is no way for her to determine which chemicals cause specific health problems.

"The size of the community is a big problem for health-driven studies, because in order to determine cause and effect, you typically need a large cohort, and Turner Station is such a small community that the epidemiologists I have talked to have agreed that it would be almost impossible to establish a clear cause and effect relationship," Rule wrote.

She wishes that there were specific data for the area to appease the concerns of the community members. "If you ask the residents, they think they do have a higher cancer rate," she said. "[But] they only know of the people surrounding them, so they are biased in many ways."

Nelson, Vice President of the Turners Station Conservation Teams however, says that she cannot explicitly connect any health problems to the buried chromium, as the studies have not occurred yet. This is partially because the Honeywell's studies have not told the community that they need to worry about anything.

"We have more health issues from the pollutants [that are coming] from the steel mills. I can't say that we have any health issues from the chromium," Nelson said. "So based on presentations that have been provided to us, it says that we are not at health risk because of the chromium. It's not near the community."

Rule's project would not just focus on the Dundalk work environment itself, but on the air that affects the entire community. Unfortunately, she is unable to do anything without first receiving grant money to pay for the study and provide the researchers with a salary. As of October 2012, she has received enough money to do a pilot project and currently has very preliminary results. She has just completed another proposal, and will find out if she receives funding in April 2013.

"I am actually optimistic that we are moving along," she expressed in an email.

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Raychel Santo | *Public Health Studies & Global Environmental Change and Sustainability, Class of 2014*

A Look Behind the Label: Understanding GMO Labels and Opinions in France

The national and international debate over genetically modified organisms (GMOs) has reached new heights in recent months. Despite concerns over their long-term effects on public health and environmental safety, genetically engineered (GE) crops are gaining a ubiquitous presence in our food supply. As a result, consumers, farmers, and certain companies across the world are coming together to demand that GE seeds be prohibited, or at least foods containing them be labeled (not currently required in the U.S.), so that concerned citizens can avoid them.

Last November, California citizens voted on Proposition 37, a ballot initiative to require the labeling of GMOs. Despite being outspent fivefold by the opposition coalition (which was comprised of large companies producing and using GMOs, including Monsanto, DuPont, PepsiCo, Coca Cola, etc.), the initiative lost by only 2%.[1] Despite the loss, many argue that the initiative did not fail completely, for it has spawned a series of GMO labeling pushes in states throughout the country.

GMOs are a relatively new, yet increasingly pervasive phenomenon in the world. Genetic engineering involves transferring DNA from one organism to another in order to produce a new species with desired traits. For agricultural crops, these traits include herbicide tolerance (allows herbicides to kill weeds but not the plant), insect resistance (protects plants from harmful pests), and alleged high-yield production or drought resistance.[2]

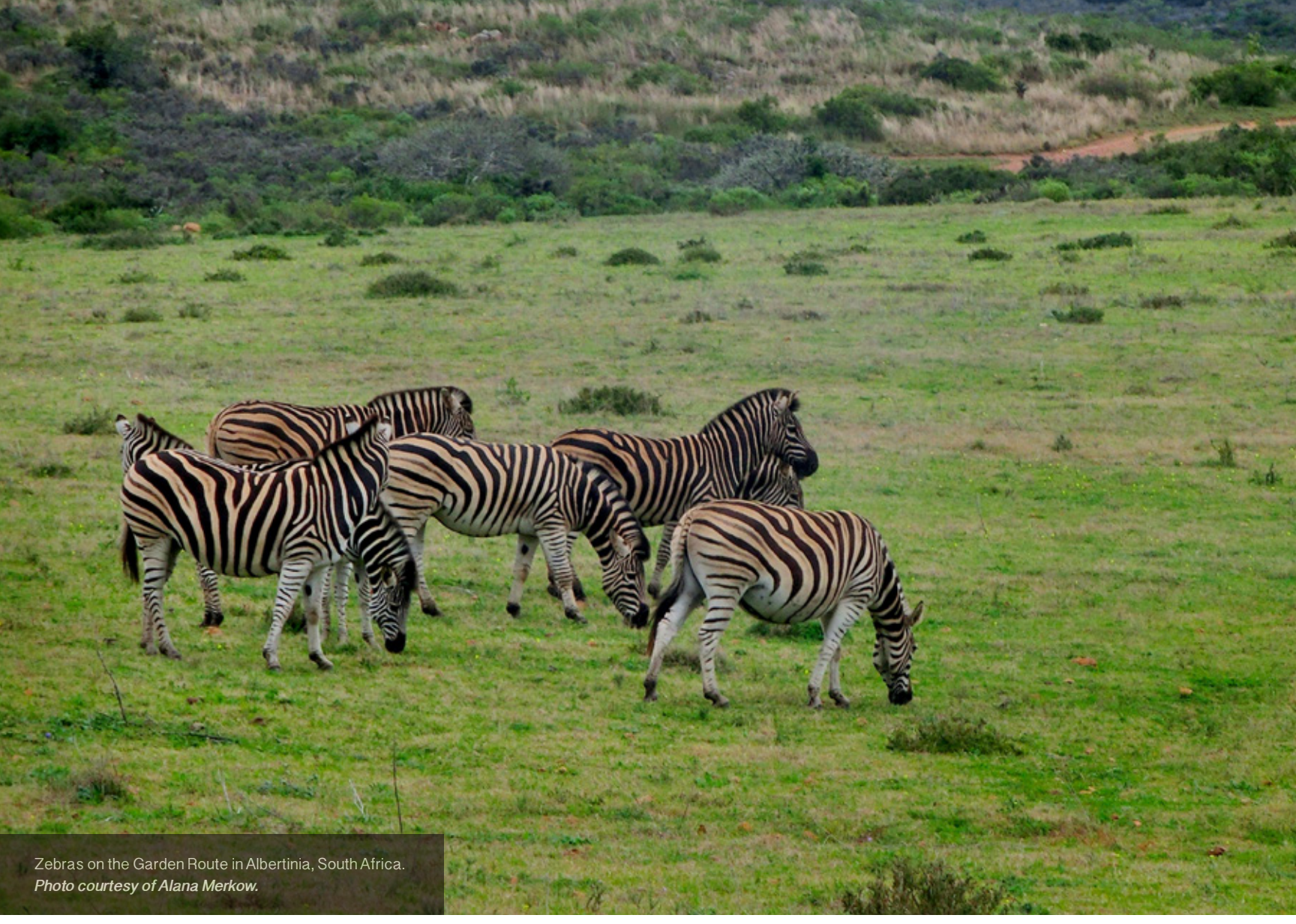
Since the U.S. government's approval of GE crops less than 20 years ago, 88% of corn, 93% of soybeans, and 94% of cotton grown here are genetically engineered today.[3] An estimated 70-85% of conventional processed foods contain GMOs,[4] a fairly high percentage considering that only eight GE crops are currently available in the U.S. The U.S. alone produces over 43% of the world's GE crops.[5] GE salmon, the first transgenic animal for human consumption, is pending FDA approval and could be on dinner plates – unlabeled – by the end of this year.

Proponents of GE seeds state that they can reduce the use of pesticides and help combat the growing challenges farmers will face resulting from global climate change. However, according to a report by a body of over 400 scientists commissioned by the World Bank and United Nations, GMOs offer no significant improvements in fighting global hunger and poverty or enhancing rural livelihoods over traditional, cheaper and more effective "agro-ecological" approaches.[6] Another 2009 report found that GE crops offer little to no increases in crop yields, and that most yield increases over the past two decades have come from non-GE approaches.[7]

Apart from the intended benefits from GMOs, experts across the world are concerned that we lack evidence of GMO's long-term safety.[8] GMOs may cause toxic effects to certain tissues and organ systems;[9] introduce new allergens into the food supply;[10] increase long-term pesticide and herbicide use;[11] alter foods' nutritional value;[12] and disrupt natural ecosystems.[13] Unlike strict drug approval requirements, there is no standardized approval process for GM foods.[14] Most studies on animal safety tests of new GM crops are only carried out for 90-day periods,[15] limiting knowledge about their long-term effects. More concerns surface as research continues. A 2011 study found the insecticide used in GE corn is now present in the bloodstream of 93% of pregnant mothers and 80% of their umbilical cords.[16]

Another matter concerning consumers and industry watchdogs is the fact that an estimated 90% of GE seeds in the U.S. are owned by the international agribusiness Monsanto.[17] This company conveniently sells the herbicides and pesticides used for its seeds. Monsanto also owns many of the companies that test the application and safety of GE crops and has filed hundreds of lawsuits against farmers whose fields are inadvertently sown with their patented seeds.

While the possible benefits and risks of GE foods continue to be debated, the prevalence of GE seeds continues to grow each year. This poses a threat to organic farmers whose crops are vulnerable to "gene flow." This phenomenon occurs when GE seeds from neighboring fields cross-pollinate with their own seeds (which must be free of GMOs to be organic). Moreover, unrestricted growth of such an uncertain technology carries a



Zebras on the Garden Route in Albertinia, South Africa.
Photo courtesy of Alana Merkow.

significant risk of changing our environment in irreversible ways.

Even if consumers want to avoid GMOs, it is difficult to do so because of their widespread prevalence in our food system. Buying organic foods or foods with the new "Non-GMO Project" seal are the only ways Americans can ensure that they are not consuming GMOs. That said, organic and non-GMO certified foods make up less than 5% of all foods sold on the market. Thus, many consumers have begun demanding GE foods bear labels so that they can make informed choices. According to a 2010 survey,[18] 93% of Americans want GE foods to be labeled. Over 50 countries already require it, including all the EU states, Japan, India, and China.

In fact, most of the EU has fervently upheld the "precautionary principle," rigorously assessing their foods' heath and safety ramifications *before* commercial authorization. France was one of the first countries to enact the GMO label requirement in 2004[19] and also one of the leading forces behind the EU's moratorium on the approval of GE crop cultivation after only two GE crops were approved. I was intrigued as to why the French were so much more invested in this issue than the U.S. and how its policy has been put into action.

Last summer, a fellow Hopkins student and I traveled around for two and a half weeks to five different French cities (Tours, Beaugency, Lyon, Annecy, and Paris) in order to gain a sense of the GMO label pervasiveness and effectiveness in France, as well as public opinion about this topic. After analyzing over 400 food labels, we found no foods with GMO labels at all, confirming the fact that less than 0.01% of foods grown in the EU are GM, none of which are currently grown in France. Even though Spain, by far the largest country producing GE crops in the EU,[5] is geographically near France and millions of tons of GE animal feed are imported into the EU each year,[20] the emphasis on locality and origin of foods, even processed ones like breakfast cereals, is so important in France that it is nearly impossible to find GE foods there. Many also suggest that since GMOs must

be labeled in the EU, companies avoid using them because consumers would avoid their products.

While traveling, we also interviewed 45 consumers, restaurant owners, and farmers, finding a remarkable knowledge base about this issue. From a bookstore clerk and an Indian restaurant owner to managers of an *epicerie* (spice shop) and full-time farmhands, the issue has gained widespread awareness throughout France. Ordinary citizens cited Monsanto's global influence; others admitted that they buy organic foods for their families even if they purchase conventional foods for their restaurants/stores. While I did not conduct a similar study here to be able to statistically compare French and American opinions, I wondered often throughout my trip why Americans were not as concerned about GMOs as Europeans. If we were, perhaps we would be more proactive about the issue.

Upon further consideration, however, I have realized that if the recent activity around GMO labeling initiatives is any indication, America is on a path to a more decisive stance on GMOs in the coming years. Even if no significant harm is caused by GMOs, the scientific uncertainty surrounding their long-term public health and environmental impacts has raised enough concern to warrant further action. The American Public Health Association, American Academy of Environmental Medicine, Consumer's Union, Environmental Working Group, and over 3000 other professionals and organizations support the notion that consumers have the "right to know" whether the food they are eating is genetically modified or not.[21] They recognize that without mandatory labeling, it is impossible to track potential adverse health effects of GMOs. Labeling for other food additives, such as trans fats, has proven successful in determining their harmful effects. Ultimately, if Americans do not have significant influence over whether GM crops or animals enter our food supply, they should at least be able to avoid them if they choose.

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FEATURES

Hearts in the right place: a youth cardio-speciality camp | On the outskirts of the Kancheepuram District, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Christina Li | *Public Health Studies, Class of 2013*

St. Joseph's Home:

A Unique Healthcare Facility in Post-Apartheid South Africa

The halls were quiet, except for the squeak of hurried shoes against the linoleum floor. The slight chill in the air was strangely invigorating as I huddled against the space heater with clipboard and pen in hand. Then, as the minute hand of the clock slowly reached seven, the ward came alive; children began climbing out of bed, clamoring for breakfast in Xhosa or Afrikaans. The nurses switched to a fast pace, running around after them with clothes in one hand and medicine in the other. The television started to blast American shows and music, which added to the boisterous atmosphere. It was another typical day in the Sweet Basil ward at St. Joseph's Home in Cape Town, South Africa.

The effects of the apartheid government's racist policies can still be seen in the form of modern-day health inequalities.

Despite the abolition of apartheid in 1994, the effects of the era can still be seen in modern South Africa's dysfunctional health system, high unemployment rate, and generalized HIV/AIDS epidemic. South Africa's political history has greatly influenced the overall health status among different groups of people and their access to health-related resources and services. According to the article "The health and health system of South Africa: historical roots of current public health challenges," the "health and social consequences of despotic, unelected, or poorly functioning elected governments can be long lasting." This is especially true of South Africa, where the effects of the apartheid government's racist policies can still be seen in the form of modern-day health inequalities.

From 1948 to 1994, the National Party instituted a policy of segregation throughout the nation. This devastated the country's overall health, as apartheid enforced nationwide racial discrimination. People were placed into different racial groups based on skin color: white, black, or colored. Colored people consisted of those of mixed, Indian, and Asian (Malay, China, Indonesia, etc.) backgrounds[2]. Apartheid resulted in a racial, social, and economic hierarchy where whites were at the top and blacks at the bottom. Marriage was prohibited between whites and non-whites, and many jobs were "whites only".[2] In addition, blacks and coloreds were forced out of their homes into segregated areas called townships that had limited health care resources, employment opportunities, and education. This resulted in high rates of infectious diseases, such as STIs and HIV, and overall mortality.[1] 13.6% of black Africans in South Africa have HIV/AIDS, while only 0.3% of white South Africans have the virus.[3]

While there have been great strides to improve equity throughout the country since the abolition of apartheid in 1994, economic and health disparities between races remain. Due to decades of forced discrimination and segregation, many black and colored people continue to live in townships, which lack well-resourced clinics and schools. A recent study conducted at the University of Cape Town found that currently, 10.3% of black South Africans have medical insurance, in comparison to 70.9% of whites.[4] Those living in informal settlements, where sanitation, clean water, and safe housing are inadequate, are particularly affected. Thus, the lack of resources in townships and informal settlements have adverse health effects on the children living in these areas, especially those who are ill: their parents are either too busy working, addicted to drugs, or financially unable to provide for them.[5]

To better understand this issue, I interned with junior Public Health major Ndubisi Okeke, at St. Joseph's Home in the Western Cape of South Africa as part of the Public Health Studies Department summer study abroad program in Cape Town. Founded in 1935 by Pallottine Missionary nuns, St. Joseph's Home is a non-profit organization located on the outskirts of Cape Tow. Because the nuns witnessed many families who were unable to take care of their chronically ill children, they decided to create a safe haven for those children. St. Joseph's Home provides free medical and rehabilitative care for children with chronic illnesses, such as HIV/AIDS, cancer, diabetes, and cerebral palsy. The children, mainly from the townships in the Western Cape, are referred to St. Joseph's by local hospitals because their family situations are too unstable for them to live at home, given their

The patience of patients | Institute of Child Health & Government Hospital for Children | Egmore, Chennai, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

health conditions. Currently, the home consists of five medical wards: Sunflower for HIV/AIDS/TB patients, Daisy for oncology and diabetes patients, Sweet Basil for neurological patients, Freesia for girls older than ten, and Protea for boys older than ten.[5]

Since some children stay at St. Joseph's for months, or even years, the home has expanded to accommodate for other aspects of complete well-being. In addition to the five wards, St. Joseph's also has 24-hour nursing care, a competitive nursing school, a special needs school that is open to the public, a daycare center, occupational therapy, physiotherapy, family and caregiver education, and spiritual/emotional support. A vital aspect of St. Joseph's Home is its social work services. Social work is an important aspect at St. Joseph's, since children are admitted to the Home due to unstable and unsafe household conditions. Thus, social workers are needed in order to monitor the patients' family situations and to ensure that the children can be discharged to a safe and healthy environment. Two social workers work full-time at the home; they coordinate admissions, re-admissions, and discharges. They also remain in contact with the children's families, and create a treatment plan for each child. Most importantly, social workers conduct home-visits and follow up with discharged patients to make sure that they are healthy and safe.[5] Thus, St. Joseph's Home not only focuses on tertiary prevention by providing medical treatment for the children but also places an important emphasis on preventing future relapse. This is especially important since these children have chronic illnesses that require constant, stable care, familial support, and a secure living environment.

Since nursing care is vital to St. Joseph's mission, Ndubisi and I conducted a time motion study in order to evaluate the appropriateness and effectiveness of the care that the Home provides. A time motion study measures the amount of time it takes to complete a task; in this case, we observed the nurses' activities in the wards and the amount of time it took for the nurses to accomplish each activity. Since non-profits such as St. Joseph's are funded mainly by state and private grants and donations, they often face financial issues.[5] Thus, the goal of the time motion study was to analyze the efficiency of the home's nursing care and to serve as leverage to the Western Cape Provincial Government for more funding. The study was conducted in three wards: Sunflower, Sweet Basil, and Freesia. We observed the nurses for their entire twelve hour-shifts in each ward, from seven in the morning to seven at night. At the beginning of each shift, we obtained general information about the ward (how many patients, how many nurses, etc.) from the registered

The village siblings | Uncharted village slum near Chromepet, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

nurse (RN). Then we split up the remaining nurses and observed their activities at ten-minute intervals. After observation of the three wards, the data was compiled and analyzed. We found that the nurses in charge of each ward (R/N) were on par with their designated tasks, but the nurse assistants often took on tasks outside their scope of services, such as bathing, feeding, and folding clothes. Such activities do not require much training and can be conducted by less qualified individuals known as carers. Since carers are paid less than nurse assistants, Home funds can be more efficiently utilized to ensure that certain housekeeping tasks can be given to carers, and nurse assistants can complete more of the tasks for which they are paid. Therefore, the data we compiled will assist St. Joseph's in their budgeting decisions to ensure future efficiency.

In order to combat the issues that numerous children and families in townships face, St. Joseph's Home was developed as a unique solution to the local health and social problems that resulted after decades of apartheid policies. Not only does St. Joseph's Home provide medical care for children affected with chronic diseases, but it also points them down a wholesome path towards a healthy lifestyle by providing the children with other vital necessities for complete physical and social well-being. Overall, St. Joseph's is a great example of an innovative public health practice that addresses the needs of the local population, while taking into consideration the history, culture, and current situation of the issues that it tries to combat. There is no single solution to health and social problems throughout the world. Rather, public health programs such as St. Joseph's Home must tailor their mission to the specific and local needs of the people they are helping.

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Kristine Wagner | *Public Health Studies & Spanish, Class of 2012*

Rethinking the Health Consequences of Development in the Amazon

Oil and the Secoya Indigenous

The world runs on oil. Yet the extraction and transportation of oil are never really forefront on American minds until a major spill comes onto our shores. Before I went to Ecuador, I had a general idea about where oil came from: wells under the sands in the Middle East or under layers of dense vegetation in equatorial rain forests.

While researching oil issues at Hopkins, I read about an $18 billion environmental lawsuit involving 30,000 indigenous Ecuadorians. The plaintiffs sought reparations from Chevron for the contamination of land, air, and water due to decades of oil drilling and waste disposal in the Amazon rainforest. I discovered that the health and environmental consequences of extraction were more far-reaching than I had initially thought. As my Woodrow Wilson Fellowship project, I decided to study those consequences further.

[T]he issues of resource extraction are much more complicated than a basic narrative of good vs. evil.

Oil industry development has changed the land, lives, and cultures of the many indigenous groups that live in Ecuador. Rapid transformations have taken place as roads built by oil companies have given workers and colonists access to vast tracts of forests — forests that have belonged to the indigenous groups for hundreds of years. Legislation in Ecuador has encouraged development in the rain forest without recognition of the rights of the indigenous people to the land on which they live.[1] With the introduction of colonists and capitalism to the Amazon, new diseases, drugs, technology, and ways of life have been integrated into the rain forest and have led to the drastic restructuring of many indigenous societies. Additionally, drilling for oil has been destructive to the Amazon. Not only have oil spills, pipeline bursts, deforestation, and the creation of over 900 petroleum waste pits added to the issue, but billions of gallons of toxic waste water have been dumped into waterways.[1]

DEVELOPMENT & THE SECOYA

The Secoya are a small indigenous community settled along the Aguarico River. This ethnic group used to number in the tens of thousands when missionaries first reached the region in the 17th century.[2] Now the community numbers only around 600 within the three major settlements on the river. Traditionally, they moved about their territory in groups every 5-20 years, while cultivating the land, hunting animals, and gathering food.[1]

While staying in the community during the summer of 2011 and January of 2012 as part of my Woodrow Wilson Fellowship, I conducted interviews with key community members about how oil industry development changed their health care and access to medicine. I expected to write about how development in the area has been a force of destruction to their health. I expected to confirm the doom of a beautiful way of life. That is, I expected to join in the chorus of activists and environmentalists I had traveled with in universally denouncing development and wishing for a return to the past.

I wanted to find out more about the growing influence of Western culture on their medicine, and I found that the outlook was not as bleak as it had first been presented to me. The people who I stayed with and those I interviewed did have stories about cancer, and they told me about times when their river ran black from an oil pipeline rupture. They told me that cultural values are shifting as young people travel outside of the community and no longer share the worldview of the elders, and that traditional medicine seems to be a dying science. But the issues of resource extraction and development are much more complicated than a basic narrative of good vs. evil.

Donald Moncayo, a native of Ecuador who gives "toxic tours" of the rainforest, holds his petroleum-stained glove to the camera. The petroleum came from a stream in an area that was certified "remediated" by the Ecuadorian government in 1998. ***Photo courtesy of Kristine Wagner.***

A petroleum waste pit in the Ecuadorian rainforest. The pit has a thin covering of plants, which obscures its dimensions - about 3 meters deep and 10 meters wide. ***Photo courtesy of Kristine Wagner.***

Donald Moncayo stands on the drainage pipe of a crude oil waste pit in the rainforest. The drainage pipe is designed to flow into a nearby stream when rain fills the pit. ***Photo courtesy of Kristine Wagner.***

An active oil rig near Lago Agrio, Ecuador. Industry facilities are often built close to rainforest communities; a small wooden house can be seen here in the background. ***Photo courtesy of Kristine Wagner.***

Traditionally, the Secoya used a plant-based system of medicine with healers (*curanderos*) as vessels of plant knowledge and medicinal skill.[3] The introduction of Western medicine began in the 1950s when missionaries first visited the Secoya and brought vaccines. The evangelists encouraged the use of Western medicine and condemned plant-based healing.[3] From the 1960s, oil industry development led to an influx of colonists in settlements and the growth of oil towns along newly constructed roads through the rain forest. Traveling the new roads to towns, the Secoya began to be able to access Western medicine in clinics and hospitals.

The exposure to Western medicine and clinics left the community wanting their own local clinic. Through Secoya political leaders, the community pressured the Ecuadorian Ministry of Health and the oil companies to build a community clinic in the early 1980s. The clinic is staffed with a trained Secoya doctor and nurse, paid by the Ministry of Health. Others are training to become midwives and lab technicians.

A decline in traditional medicinal practices accompanied the rise of Western medicine. As the Secoya see their territory decimated by colonist farms, towns, and oil wells, less land is available to the Secoya to find plants needed for traditional remedies, and the process of preparing the medicines is more time-intensive than visiting the clinic. Knowledge of medicine was passed down through generations by *curanderos* teaching their young apprentices. Now that *curanderos*' roles are diminishing, younger generations are less educated in traditional medicines.

Though these trends have occurred rapidly over the past 70 years, there is no consensus about which type of medicine is more useful or effective. Rather than replacing traditional medicine, the Secoya are increasingly recognizing the utility of using both.

Knowledge of medicine was passed down through generations by *curanderos* teaching their young apprentices. Now that *curanderos'* roles are diminishing, younger generations are less educated in traditional medicines.

THE FUTURE OF SECOYA MEDICINE

The future of Secoya medicine will be shaped by political advocacy from the Secoya Indigenous Organization of Ecuador (OISE) which has been a successful advocate for Secoya welfare in dealing with the government, oil companies, and nonprofits. OISE advocates ambitious but reasonable plans to improve the capacity of the clinic, attract more professionals, reeducate young people and families in traditional medicine, and create a medicinal plant garden. Though the litigation is still ongoing, many of their proposals are dependent upon the funds that Chevron was ordered to pay in the lawsuit.

After seeing how the community has changed, I saw that development has not been solely a negative force in the lives

A group of Secoya children in their grandparents' typical wooden house after playing on the banks of the Aguarico River. ***Photo courtesy of Kristine Wagner.***

of the Secoya. Development has meant a connection to the rest of the world, both in medicine and in every other aspect of daily life. In the community, I saw new schools built for the children. Some go on to attend university in Quito, learn English, and collaborate with foreign nonprofits on community programs that increase access to medicine and further economic development. By fighting to keep their land from irresponsible oil prospecting, the Secoya and other indigenous communities have formed exceptionally strong political organizations. Many communities throughout the country have joined together into groups like the Confederation of Indigenous Nationalities of Ecuador (CONAIE) to wield substantial power in Ecuadorian politics.[1]

CONCLUSIONS

The pollution and colonization of land without the permission of its indigenous inhabitants is unacceptable, and individuals and organizations should continue to demand fair and humane transactions. Some of the development that has happened was without permission, but wishing for a return to the past will not lead to progress. While it is important for oil companies, governments, and nonprofits to repair the damage from development, it is also imperative to recognize that communities like the Secoya now have greater access to the information and opportunities many take for granted in the developed and industrialized parts of the world.[4] The hybrid medicine of the Secoya has the potential to develop into a well-balanced system of health options with support from the Ministry of Health and the community organizations. I believe that the global public health community should have a role in securing that future and empowering developing communities to continue advocating for themselves.

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EPIDEMIC PROPORT

A DECADE

"Over 15% of Americans are currently v
disproportionate number of these indiv
populations" -*Holzer*

VOLUME 1

"There is definite promise for further study of anti-inflammatory effects in the AD [Alzheimer's Disease] brain, as these drugs may have the **capability to prevent the progression of AD** and its subsequent dementia." -*Trish*

VOLUME 3

Mycobacterium tuberculosis has infected approximately one-third of the world's population, and in India, the morbidity and **mortality** caused by tuberculosis places it among the highest priorities for disease control. -*Prabhakar*

VOLUME 5

"Perhaps the most alarming result of the lack of **effective psychological screening** and treatment can be seen in the children, who currently number over half of the world's refugee population. **Refugee children** have been found to be 40% more likely to have PTSD, 21% more likely to have depression, and 10% more likely to suffer from **anxiety attacks** than children who are not refugees" -*Graczyk*

"Because of the emphasis placed on correct feeding and proper weight gain in the first year of life, there have been no intervention programs to adjust these two important aspects of **child development**, even though studies show that rapid weight gain in the first few years of life increases a child's chances of **developing obesity** later." -*Ng*

The public health crises surrounding **Avian Flu** and **West Nile Virus** have brought to the fore the transmission of disease from birds to people. -*Groopman*

VOLUME 4

"The World Health Organization (WHO) estimates that more than **2 million premature deaths** each year can be attributed to **air pollution,** with more than half of these occurring in the developing world." -*Sellers*

"When the rest of the world was struggling with the threats posed by the **newly discovered virus** in the late eighties and the early nineties, Iranian officials associated the infection with **tainted blood** that was imported from the 'sinful' West." -*Kamiar Alaei & Arash Alaei*

VOLUME 2

"While **diabetes education** classes do have an effect on patient outcome, the clinic can improve patient health by providing a more cohesive set of services." -*Fraade-Blanar*

"In Baltimore, where it is estimated that 25% of adults, aged 18 to 60, use **narcotics** and 50,000 out of a total population of 575,000 are heroin users alone, drug use is an inescapable reality. The central goal of NEPs [Needle Exchange Programs] is to decrease the **circulation of contaminated syringes** in the community." -*Edington*

IONS

without **health insurance**, with a iduals coming from underserved minority

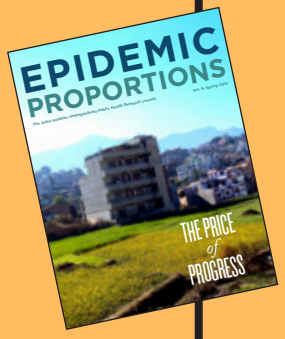
"Having the **patient-reported outcomes** integrated into the EHR is expected to promote use of the data by clinicians, to facilitate doctor-patient communication, and to **improve the quality of care** delivered." -*Steinwachs*

VOLUME 7

"Seeing the success of these initiatives and other successful collaborations in HIV/AIDS (particularly in Europe), the NIH launched an initiative entitled International Epidemiologic Databases to Evaluate AIDS (IeDEA) to establish a series of **worldwide, regional data centers** for the purpose of compiling data and monitoring the epidemic." -*Gange*

"In late 2008, as part of the fiscal year 2009 budget, New York State Governor James Patterson introduced a bill to tax non-diet soda...The following year a new **soda tax** was introduced that would add a tax of 1 cent per ounce for all non-diet sodas.." -*Quigley*

"Denmark has an **obesity** rate of 9%. On the other hand, Colorado was the last state to have an obesity rate in the single digits-and that was ten years ago." -*Quigley*



VOLUME 9

"According to the Institute of Medicine (IOM), currently about half of treatments are delivered without clear evidence of effectiveness, which 'contributes to great variability in **managing clinical problems**, with costs and outcomes differing markedly across the country.'" -*Whicher*

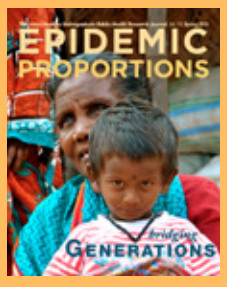
"On July 26, 2007, Costa Rica's Vice Minister of Governance and Police Ana Durán called for the implementation of protocols for intervention in different public institutions dealing with **human trafficking**. Describing human trafficking as an international crime of drastic proportions, Durán mentioned that **12.3 million people** are in situations of forced labor and trafficking..." -*Fehrenbacher*

VOLUME 8

"On October 22, 2009, President Obama signed into law the Matthew-Shepard Act, marking that date as the first day that transgender and **transsexual persons** gained **social legal protections** under federal law." -*Maia*

VOLUME 10

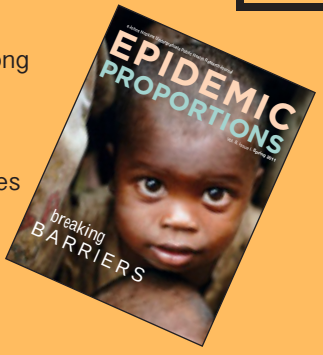
"A **hallmark of success** in this field [injury prevention] has been the effective use of advocacy to promote policies and programs that not only make the environments and products safer, but also **make the safer choices the easier choices**." -*Gielen*



VOLUME 6

"In 2003, the Food and Drug Administration (FDA) amended its nutrition labeling regulations to address the burgeoning scientific evidence that links dietary intake of **trans-fatty acids** to coronary heart disease (CHD)." -*Kwong*

"According to The Chinese Journal of Human Sexuality, the issues of **sexual minorities** are currently being ignored in China. Rape and **domestic abuse victims** do not have a strong forum in China to express their voices, and the drastic growth of AIDS patients in China since 1989 underscores the importance in facilitating dialogue about HIV." -*Hong*



"The **nurse labor supply** also poses challenges to health care systems because nurses have one of the **highest attrition rates** among any career field." - *O'Neil*

Sam Onat Yilmaz | *MSE in Materials Science and Engineering, Class of 2013; Psychology, Anthropology, & Environmental Earth Sciences, Class of 2010*

Leapfrogging 2.0

Hopkins has long had a commitment to pursuing unanswered questions across the spectrum of basic and applied sciences through the "Knowledge for the World" campaign. This pursuit, fostered by the interdisciplinary intellectual environment, has resulted in an impressive history of high-impact findings. In a recent address, President Ronald Daniels championed the collaborative work of teams of scientists and engineers as a foundation of Hopkins' strong intellectual

At the corner of healthy and happy: the road alongside a PHC | On the outskirts of the Kancheepuram District, Tamil Nadu
Photo courtesy of Kavya Vaghul .

history, and encouraged it further.

Now, there is a growing commitment to sustain this culture and to take the findings a step further into the real world. The current project I am involved with through the Johns Hopkins Institute for NanoBioTechnology and its international partners is a great example of the interdisciplinary and impact-oriented approach we value at Hopkins.

The Institute for NanoBiotechnology (INBT) initiated a program for Global Engineering Innovation, which provides a platform for students and faculty to work together on issues of social concern and help ameliorate troubling conditions in developing countries. As part of this program, Tobe Madu and I went on a trip to work with Global Cycle Solutions (GCS) in Tanzania last summer to develop a bicycle powered grain mill. While there, we spent our time trying to understand how people currently access, process, and use corn flour, a basic food staple in Tanzanian culture. We tried to grasp the underlying market dynamics and tinkered with a grain mill to identify how best to make it bicycle-powered.

Now, after returning to the Hopkins campus, we have continued our research, development, and prototyping efforts. Fortunately, we have supportive faculty members and staff from a variety of departments who have offered us their insights, expertise, and resources. The continued support of our advisor, Dr. Jennifer Elisseeff, is indispensible. Dr. Soumyadipta Acharya from the CBID program, Dr. Eric Rice from Entrepreneurship and Management, and Dr. Jane Guyer from the department of Anthropology have also been instrumental in refining our approach and getting a hold of the resources needed for product development.

In collaboration with multiple Hopkins departments and partner engineers at MIT's D-Lab, we seek to consider all the social and technical variables we can and to engineer products that could offer value to the Tanzanian consumer. This includes contemplating variables like the source of the corn, the length time consumers are willing to store to product, and the optimal type of container.

With our exploratory trip to Arusha over the past summer, this was the first year that INBT and GCS have officially collaborated, but the joint effort will surely continue for years to come. GCS is a social enterprise that Jodie Wu, an MIT mechanical engineering alumna, founded to offer affordable, quality technology in Tanzania. Wu started this venture around a maize sheller, which came out of her work as an undergrad at the MIT D-Lab. Since then, she has continued to expand the portfolio of products, and thinks that successful completion of the bicycle-attached mill can take GCS to a new level of market penetration. In starting GCS, Wu hoped to address the fact that many sustainable technologies are being developed at the university level, but most never go anywhere. This shows her commitment to making an impact, and how GCS is an optimal partner for Hopkins and the INBT.

Though the grain mill project dates to before GCS and INBT joined forces last year, we have a matching level of commitment to bring the Hopkins intellectual resources to benefit the project and make an impact on the ground. A Hopkins team spearheaded by Dr. Elisseeff and Dr. Sheila West had developed an interest in offering empowering technologies that could increase the quality of life in rural economies. In the summer of 2011, a group of engineering grad students from Hopkins (including Dr. Jeanine Coburn) visited Tanzania to learn more about the corn grinding process. Midway through their work, the team realized that GCS was dealing with similar issues surrounding the preparation of corn flour. GCS turned out to be an optimal partner for INBT as they already had preliminary designs, an existing market connection, and year-round presence on the ground.

Going forward, GCS seeks to continue offering affordable and quality technology that empowers people like the existing bicycle-powered corn sheller, which separates the grains from the cob. Currently, tractors offer communities the shelling service, but tractor owners prefer to go to places where they can process fifty to a hundred bags of corn at a time. This means that less-densely populated areas are left unserved. Families have either had the option of taking their corn to a neighboring town or spending a few hours beating the cobs with sticks to get the

job done. The bike-attached corn sheller, however, enables the delivery of services to smaller communities disfavored by the economies of scale. Unlike its diesel-operated counterpart, the bike-mounted sheller can make the processing of only 10-15 bags of corn profitable. The presence of the bike also saves time and reduces CO2 emissions involved with food transport and processing.

The GCS product portfolio has grown and offerings now include bicycle and hand-powered maize shellers, bicycle-powered cell phone chargers, and solar-powered torches with cell phone charging extensions. These products seek to enhance the quality of life in the settlements that have intermittent or no access to electricity and tend to be less-populated. This is a big target audience since only 10 percent of the Tanzanian population has access to grid electricity, which is also highly unreliable. Thus, these enabling and empowering technologies can help reduce the pressure on rural populations to migrate to urban centers, which has historically led to the formation of shantytowns and the associated public health problems.

With the arsenal of affordable and empowering tools such as the miller or the grinder, GCS seeks to engage more remote villages through community ambassadors.

Tanzania, like many African countries, is experiencing what is called "infrastructure leapfrogging." This is when the newer technologies are adopted from developed economies into developing countries without retracing the intermediate steps of technological development. For example, the cell phone network coverage now reaches 95 percent of the population although the landlines and grids are lacking.

Tanzanian infrastructure may be leapfrogging, but so is GCS. Going forward, GCS hopes to create multiple pieces of compact equipment that can be used with the same bike interchangeably. This would enable a local entrepreneur to serve his community and neighboring villages with just a backpack full of mountable technology.

GCS's original approach extends to its model for penetrating the market as well. With an arsenal of affordable and empowering tools such as the miller or the grinder, GCS seeks to engage more remote villages through community ambassadors. These young ambassadors will be selected with counsel from village elders and will continue to serve as the bridge between GCS and their communities. Not only does this business model empower youth and grant them entrepreneurial savvy, it also helps sustain the delivery of the services and maintenance of the tools. Since community members will hold the ambassadors accountable for their services, selecting someone well knit into village life will be the social engineering that goes into sustaining GCS for years to come.

The entrepreneurs in the network will have another role in addition to delivering the GCS services; they will help refine the products through communicating user information. In receiving the market feedback, GCS's hopes to practice co-creation, the invention of new technologies alongside the people who will use them. This principle gets locals more closely involved and gives a sense of ownership in the success of the project. In turn, the ideas often lead to a better product.

The feedback from the entrepreneurial network will be crucial for designing later iterations of products. However, without an existing model for the bicycle-attached mill, we feel privileged to partake in the initial design-thinking process. We are interested in building a prototype and hope to go through multiple reiterations based on feedback from the market. Timothy Brown of IDEO, a thought leader in product development, has been a good inspiration to us. He says that design thinkers must set out like anthropologists or psychologists, to investigate how people experience the world emotionally and cognitively.

Indeed, the visit to Tanzania has proven invaluable to understanding the landscape within which the products will be used. Our colleagues from the MIT D-Lab and our ever-present partner GCS will continue to inform us about the marketplace and some design parameters for the mill. Tobe, a senior in Biomedical Engineering, and I, a Hopkins alumnus and current Materials Science and Engineering graduate student, are putting forth our engineering and entrepreneurial skills in order to build the prototype of this recent addition to the GCS arsenal. Our collaborative effort is an example of Hopkins' capacity for interdisciplinary, inter-institutional, and international partnerships.

In January, the team members from MIT's D-Lab will be taking their turn to visit GCS in Arusha, and will continue to inform the design with market research while the entrepreneur network is established. We will be busy building the prototype, and plan to visit Tanzania with a functional model later this year. Current students who are interested in the project are welcome to contact Tobe and me to join the efforts on product development.

A young Secoya girl holds her baby sister in the San Pablo Secoya community in the Ecuadorian Amazon rainforest. ***Photo courtesy of Kristine Wagner.***

Melody Maarouf | *Public Health Studies, Class of 2013*

Public Health Action in WHO-ville

After seeing the effect of AIDS in Africa, working within the rudimentary hospital infrastructure in Honduras, living with an indulgent smoking culture in Europe, and viewing firsthand the subpar housing and social stratification in Hopkins's own backyard, I thought I had been exposed to almost every aspect of public health there was to experience, or at least its most common manifestations.

Whether health issues like these are determined by environmental or socio-economic factors, the majority of the world faces a health inequity in at least one way or another. These inequalities are not unique. They exist in all continents simultaneously, though they may vary slightly due to differing infrastructure, culture, and general demographics. If all these problems are so prolific, how does the global community begin to tackle these common issues? The answer: They consult the WHO. Who?

The World Health Organization. Neighboring the United Nations (UN), Médecins Sans Frontières (Doctors Without Borders), the Red Cross/Crescent, and other reputable international organizations, the WHO is the United Nations' sector devoted to "the attainment by all peoples of the highest possible level of health."[1]

It is slightly paradoxical that an organization situated in the posh and lavish city of Geneva, Switzerland, can even begin to grasp the level of destitution and injustice of the developing world. How can WHO deputies acknowledge and work to solve issues in communities so polarized from that of any city found in Switzerland?

The WHO hosts an experienced workforce from all corners of the world who have previously worked or lived in the communities most in need of health reform. An eclectic mix of professionals—once-practicing epidemiologists, doctors, lobbyists, journalists, volunteers, and current students—call the WHO their home.

During the spring of 2012, I was given the opportunity of a lifetime to join them. Following my arrival in Switzerland, I secured an internship in the WHO's department of Reproductive Health and Research (RHR), and worked under the instruction of Dr. Nathalie Broutet M.D., Ph.D., the director of the Reproductive/Sexually Transmitted Infections team.

It was a surreal experience to work with and around some of the most influential international organizations and attend meetings led by public health practitioners who I had only heard of in texts, like Director General Dr. Margaret Chan and Melinda Gates. Furthermore, the conferences corresponded to issues that I had learned about during my three years at Hopkins. For instance, there were several lectures that touched upon the Millennium Development Goals (MDG), a list of eight public health goals the UN aims to complete by 2015. These meetings linked to my projects in the RHR department, which focused on the reduction of child and maternal mortality—MDGs four and five.

My main responsibility as an intern was conducting research to develop literature reviews. Additionally, I was involved in assisting the organization of the Comprehensive Cervical Cancer Meeting that aimed to revise the most commonly requested, translated, distributed, and utilized guide for health-care providers: The Comprehensive Cervical Cancer Prevention and Control Guideline, more commonly referred in the RHR department as the "pink book."

How could a country possibly benefit from this book if they don't have the necessary resources? Initially, I was skeptical of the impact of the guideline, despite its extensive coverage on epidemiology, preventative techniques, treatment, and palliative care for human papillomavirus and cervical cancer. I thought that the hundreds of thousands of dollars that went into creating this guideline would be better spent on providing technologies to marginalized communities, rather than the compilation of a pretty little pink book.

The goals to create a healthy and sustainable universe and future I had previously believed to be far-fetched turned out to be not so distant after all.

It was only after I started working closely with the heads of the cancer and STI/RTI departments that I understood the impact of the guideline. More than a hundred professionals traveling from the

Continual learning: against the odds of a mining community, miners' children arrive prepared for tutoring | Chromepet, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Ministries of Health in Bhutan and Rwanda, the International Union Against Cancer, the Center for Disease Control and Prevention, and even the Johns Hopkins School of Medicine's own affiliate, Jhipego, among others, worked for several years to compile this 200-page guideline book. Each strong-minded individual's opinion helped shape the piece to maximize its effectiveness.

To prepare for the Cervical Cancer meeting, I was first asked to develop a literature review on the burden of genital warts (as a manifestation of HPV) in male populations. The review noted the prevalence of genital warts and the importance of the quaternary-HPV vaccination for men. Additionally, it explained the need to increase the distribution and access to the vaccine in the female population. Through discussions with WHO's HPV department directors, as well as eighth professionals from the Global Alliance for Vaccines and Immunization (GAVI), the committee determined that increasing the coverage of the vaccination in the female adolescent population is much more cost effective.

After completing this report, my focus shifted to organizing the Cervical Cancer guideline-update meeting. Following the arrival of the professionals, I was closely involved in reporting the changes that were suggested and voted on during the discussions. The notes recorded and consolidated by myself and others are being

The standard of care | Institute of Child Health & Government Hospital for Children, Pediatric Oncology War | Egmore, Chennai, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

integrated into the revised chapters. After the WHO Guideline Review Committee receives the updated chapters and approves the document, it will be distributed in replacement of the 2006 version of the "pink book."

My supervisor's high expectations allowed for the greatest learning experience I could have ever imagined. Stuck in a classroom, it is difficult to understand the issues that are afflicting a country and the actions needed to help alleviate those issues. Of course, there are always goals, but often goals seem idealistic if one is learning about them in an area far removed from the actual public health action. For instance, during my first introductory course in public health, the eight MDG goals seemed too impractical to achieve within a 15-year deadline. Halve the proportion of people without sustainable access to safe drinking water by 2015? This seemed impossible, but the WHO did it well before the 2015 deadline.[2] In fact, as I drafted a literature review aimed at tackling MDGs four and five, the water aspect was completed. This success further instilled promise that the work I was actively completing was not purely idealistic. The guidelines make a difference, though the effects may not be completely immediate. The goals to create a healthy and sustainable universe and future I had previously believed to be far-fetched turned out to be not so distant after all.

While I may have had to return back to Johns Hopkins after an amazing semester abroad, I am positive that I will return to Geneva once again to work at one of the myriad international aid organizations. That said, au revoir Genève!

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Katherine Tan | *Applied Mathematics and Statistics & Biology, Class of 2013*

Mother's Gift: Randomized Maternal Flu Vaccine Trial in Rural Sarlahi, Nepal

What is the best gift a mother can give her child? When an infant is born, it acquires maternal antibodies through the placenta, protecting it from infections. In addition, infants can acquire further protection from breast milk, which contains immunologic and other protective factors such as immunoglobulin G (IgG), secretory immunoglobulin A (sIgA) and leukocytes that decrease neonatal infections. Recent findings have suggested that infants born to women vaccinated with a H1N1 influenza vaccine are more protected from influenza than those born to unvaccinated women. Nonetheless, there is a dearth of studies showing the relevant benefits of breast milk to the acquired immunity of infants. The lack of studies sparked the Mother's Gift – Maternal Flu Vaccine Trial (MaGIFT) project, which I was honored to be a part of last summer.

Breastfeeding has been shown to increase emotional ties between mother and child. In Nepal, family ties are close,

A Flu Data Collector (FDC) from the Maternal Flu Vaccine Trial speaks to a young woman about her pregnancy, and if she has recently experienced any flu-like symptoms. ***Photo courtesy of Katherine Tan.***

and hence, breastfeeding is not a rarity. Traditional Nepalese women never show their legs to men, but are comfortable exposing their breasts to nurse their infants in public areas. The Nepal Nutrition Intervention Project Sarlahi (NNIPS) group took advantage of the prevalence of breastfeeding in the Nepali community to conduct the MaGIFT study.

One of the goals of the project was to investigate the increased immunity of infants after administering a flu vaccine to pregnant women. We hypothesized that the flu vaccine would increase the immunity of these infants. To measure that, the field data collectors (FDCs) surveyed a variety of information, such as the breastfeeding frequency and amount, the presence of flu-like symptoms, and infant birth weight.

Twenty miles away from India, Sarlahi was non-habitable due to endemic malaria until the 1960 dichlorodiphenyltrichloroethane (DDT) campaign. In 1988, when NNIPS started its first intervention project in the district, it faced many technological and human resource challenges. The migrant population, while heavily invested in cultivating Sarlahi's fertile land, was relatively uneducated. T.R. Shakya, the project Field Manager who has worked with NNIPS for over twenty years, told me, "When we first recruited field workers, we administered a writing test. The first time we did it, not a single person was able to write the numbers one to ten in roman numerals." There was neither electricity nor running water, and the closest landline was a 40-minute drive away. Despite these challenges, NNIPS has successfully researched many important global health topics over the years, most notably finding that vitamin A supplements reduce maternal and child mortality.

I was based in Kathmandu, the capital of Nepal, as a data management and analysis intern. Because of the multitude of data collection forms required for this study, a lot of data cleaning needed to be done before the actual analysis. I worked extensively with the data team to troubleshoot any inconsistencies and inaccuracies in the database. Using the data collected about flu-like symptoms, I conducted preliminary analysis on the prevalence of influenza for data quality monitoring purposes.

The MaGIFT trial tests significant hypotheses about the transmission of antibodies from mother to child. More importantly, it has empowered women in rural Nepal to engage in the workforce.

One pattern I quickly noticed was the ages of women when they marry. The average age is about seventeen, and around ten percent of women eloped before their first menstrual period. While some of the husbands of these teenage brides are older men in their late twenties, most of the grooms are within five years of their wife's age.

Traditionally, when women marry in Sarlahi, they move into their in-laws' house. However, when they give birth, they return to their family's house (Maiti) to deliver. This practice is important as it shows that the woman's family welcomes her for this special occasion. Some women continue to live in their maiti beyond delivery. This caused some bottlenecks in our data collection, as we based our household numbers on the household the women lived in permanently.

One of my assignments was to match about 300 unknown nasal swab samples to individuals in the study, in order to accurately identify influenza cases. Many of these swabs came from infants and often the only information we had was the name of the baby and the household number. In Nepal, name changes occur very regularly, especially in the early months, as many people do not have a birth certificate until later in life. Furthermore, the household numbers could be the maiti address instead of the woman's permanent home, causing more complications. To solve this problem, I constructed "intelligent guessing" algorithms to match the sample numbers, using information such as the range of sample dates and birth dates to verify the guesses.

In addition to data management and analysis, I had the opportunity to visit Sarlahi and observe operations on the field site. The NNIPS management established a hierarchy of responsibilities for the project. This model has been very useful for NNIPS, and has been replicated in similar projects in other developing countries. Other than one research associate from Johns Hopkins, all NNIPS full-time employees are Nepali. Every village has its own team of data collectors who report to a manager. In addition, there is a birth team that travels through all the villages surveying the birth conditions of the infants. The establishment of just one birth team reduces any discrepancies in measurements, and any systematic errors can be easily rectified. For the MaGIFT trial, NNIPS recently established a vaccine team consisting entirely of women – a significant deviation from their past employees who were mostly males. The justification for employing women is that

Generations | On the outskirts of the Kancheepuram District, Tamil Nadu ***Photo courtesy of Kavya Vaghul.***

participating women may feel more comfortable during the vaccination process.

These women are villagers who are smart, dedicated and lucky enough to have gone to nursing school. Without NNIPS, many of them would have left their communities to pursue better financial opportunities in Kathmandu or other big cities. The vaccinator positions allowed these women to stay close to their families while also providing for them financially and learning important skills. These women are strong in so many ways that I could not stop admiring them. For one, they could physically transport heavy boxes of vaccines around in 110°F temperatures – a skill certainly not everyone possesses!

The MaGIFT trial tests significant hypotheses about the transmission of antibodies from mother to child. More importantly, it has empowered women in rural Nepal to engage in the workforce. Since its advent in 1988, NNIPS has transformed the lives of many villagers; some of the younger generations are currently pursuing further education in Kathmandu and even the United States. By allowing women to serve women through the MaGIFT trial, NNIPS enables mothers to provide children with another important gift: opportunity.

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A model citizen | Uncharted village slum near Chromepet, Tamil Nadu. *Photo courtesy of Kavya Vaghul.*

PER

SPECTIVES

Andrea Gielen, ScD, ScM | *Professor and Director, Johns Hopkins Center for Injury Research and Policy*

Meeting the Challenges of Injury Prevention: A Look Back at Past Innovations and an Assessment of Our Current Situation

Are you surprised to learn that injuries are the leading cause of death for Americans ages 1-44?[1] They are also the second most costly health problem in the United States – second only to heart disease – generating $406 billion in lifetime costs each year. [2, 3, 4] Most people are unaware of this "epidemic" hiding in plain sight. Yet virtually everyone knows someone who has been injured seriously enough to have gone to the emergency room and even died from an injury. Those often at the highest risk are individuals living in rural areas, low-income urban environments, young people, and older adults. Motor vehicle crashes, pedestrian injuries, prescription drug overdoses, falls, traumatic brain injuries, burns, assaults, and drowning are among the most common types of injuries.

However, decades of research have taught us how to prevent many of these tragedies. In fact, much of the early work showing how epidemiological methods could help understand the causes of injury was done at the Johns Hopkins Bloomberg School of Public Health's Center for Injury Research and Policy under the leadership of its first director, Professor Susan P. Baker.[4] By working with the Medical Examiner's Office right here in Maryland, Professor Baker uncovered some of the common patterns in the causes of injury deaths. For instance, Professor Baker used the epidemiological tools to demonstrate that infants less than 6 months old were at the highest risk of death in an automobile; these data were essential in changing state policies throughout the country to require the use of infant car safety seats, something that is commonly taken for granted today.

The Centers for Disease Control and Prevention highlighted workplace safety and motor vehicle safety as two of the ten greatest public health achievements of the 20th century.

There are many other examples of success in reducing the toll of injuries on society. The Centers for Disease Control and Prevention highlighted workplace safety and motor vehicle safety as two of the ten greatest public health achievements of the 20th century.[5] Safer workplaces, homes, communities, roadways, and motor vehicles, as well as better-informed citizens, who use safety devices such as seatbelts and make better decisions such as not drinking and driving, are behind these successes. Reducing injury risk is only possible through research and its application to programs and policies. A hallmark of success in this field has been the effective use of advocacy to promote policies and programs that not only make the environments and products safer, but also make the safer choices the easier choices.

Yet the work is far from finished considering the number of injuries, disabilities, and deaths that still occur due to accidental and intentional causes. Furthermore, there are clear disparities in injury rates. For example, the American Indian and Alaska Native (AI/AN) population has the highest motor vehicle death rate in the U.S., a rate which is significantly greater than that of any other race or ethnic group.[6] Families living in low-income neighborhoods with high rates of vacant properties are at a significantly elevated risk of house fires.[7] Many of our proven effective injury countermeasures are not reaching these populations, perhaps because there has been insufficient investment in making environments safer or because individuals do not have access to the information or safety products they need to protect their

families and communities. For example, research at Johns Hopkins has found that urban, low-income families face many barriers that prevent them from carrying out recommended home safety practices, including having working smoke alarms.[8]

A hallmark of success in this field has been the effective use of advocacy to promote policies and programs that not only make the environments and products safer, but also make the safer choices the easier choices.

Currently, the most important task at hand is to apply the best available scientific evidence to reduce the burden of preventable injuries. Changing environments and changing human behavior must go hand-in-hand to reduce injury risk. Here in Baltimore, faculty and staff of the Johns Hopkins Center for Injury Research and Policy are applying this type of strategic thinking to address many of the pressing injury problems in our region. For instance, the University is working with the Center to reduce pedestrian injuries around the Johns Hopkins campuses, including making roadway changes and launching new educational campaigns.[9] The Center has also partnered with pediatricians at the Johns Hopkins Hospital to develop national model programs that provide low-income families with better access to more affordable life saving safety products.[10, 11] As a result of decades-long partnership with the Baltimore City Fire Department, the CARES Mobile Safety Center brings life-saving safety products and personalized education to families throughout Baltimore.[12, 13] New partnerships are being built with groups promoting active living to ensure that increasing physical activity will not result in increasing injury rates.[14, 15] Finally, new ways to use information technology tools are being developed, such as interactive web-based educational programming to better meet the injury prevention needs of parents as well as trauma survivors.[16, 17]

The Center has served as one of only eleven national "centers for excellence in injury research" for 25 years, and its research has informed injury prevention policy and programs nationally and globally. Center faculty, staff, and students are part of a community of injury prevention professionals dedicated to reducing the toll of injury through science and translating what is learned into practice. There are numerous national and global initiatives being introduced under the leadership of the Centers for Disease Control and Prevention and the World Health Organization among others. In June 2013, Baltimore will be the site for a National Meeting on Injury

Child exploring Atlantic City beach. ***Photo courtesy of Naomi Bouchard.***

and Violence Prevention sponsored by the CDC, Safe States Alliance, and Society for Advancement of Violence and Injury Research.[18] The Johns Hopkins Center for Injury Research and Policy is the local host for the conference along with partners from other divisions of Johns Hopkins University, the R Adams Cowley Shock Trauma Center, the University of Maryland, and the Maryland Department of Health and Mental Hygiene.

The trajectory of success to date in the injury prevention field[19] suggests unparalleled opportunities in the future. Graduates in public health, engineering, law, government, medicine, nursing, and many other disciplines are needed to contribute to further reducing the injury burden. Work still needs to be done on designs to enhance the safety of consumer products, urban spaces, buildings, highways, and workplaces. New, innovative communication strategies are also needed to effectively convey the injury prevention message to the public, high-risk groups, and policy makers. Most importantly, new partnerships among individuals and groups with common goals could improve the efficiency and effectiveness of efforts to promote health and safety.

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HISTORICAL PERSPECTIVE

Did you know injury has actually increased as a cause of death? In the past, most deaths were due to infectious diseases such as smallpox and polio. Since many of these diseases have been eradicated or significantly reduced in impact, causes of death such as injury became prevalent. The improvement in technology has also contributed to this increase; with more motor vehicles and other such equipment, there is higher risk for people to die from injury.

Graham Mooney, PhD | *Assistant Professor, Institute of the History of Medicine, Johns Hopkins School of Medicine*

Public Health and Primary Care: Maryland's Track Record of Innovation

Former Baltimore City Health Commissioner Dr. Peter Beilenson recently stepped down from his post as Howard County health officer to lead a new non-profit health insurance co-op, Evergreen Health Cooperative. Evergreen—which has received a federal loan of $65 million to help it get established—will employ a range of salaried health care professionals to provide seamless preventive and primary care under the Patient Protection and Affordable Care Act (PPACA, popularly known as Obamacare).[1]

Evergreen will operate through the Maryland Health Connection, a marketplace due to begin operations in January 2014 that will allow individuals and small businesses to compare insurance benefits, rates, and health care quality.[2] So far, the state of Maryland has been handed $157 million in federal dollars to set up the marketplace, putting it alongside California, Connecticut, Hawaii, Iowa, Nevada, New York, and Vermont at the forefront of this type of innovative health care service in the U.S.[3]

Maryland's politicians have been quick to hail the state's progress so far. Congressman Elijah Cummings remarked that Maryland was one of the first states to implement a health care exchange. He said, "[Maryland would] continue to lead the way in improving health care access for all." Senator Barbara Mikulski said, "Maryland is an innovation state, and I am committed to ensuring we are at the forefront of putting health care into action."[4]

Amidst all the cheerleading, it is worth remembering that this is not the first time that Maryland has led from the front in an attempt to address unequal access to primary health care. Two decades before the introduction of Medicare and Medicaid, the Maryland State Department of Health became one of the first in the U.S. to provide free medical care to those who could not afford to pay.

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A State Committee on Medical Care was created at the instigation of the Medical and Chirurgical Faculty of Maryland. The Committee's report showed that Maryland's rural counties were massively underserved, and in response, a medical care program was enacted in 1945. It placed responsibility for the care of indigent and 'medically indigent' persons in the counties on the state Department of Health, which paid family physicians, hospitals and dentists on a fee-for-service basis (each test, exam or procedure was paid for according to a set schedule).[5]

Clarifying 'medically indigent' was essential in determining who got health care and who did not. Maryland adopted the American Medical Association's (AMA) definition that 'a person who is unable to meet the costs of medical, dental and other specified physical care without spending money which otherwise would go toward basic living necessities' can be considered medically indigent.[6] The county health officer had the final say in whether an individual met this criteria. In a move that resonates with the sliding scale of premium credits under the PPACA, the designation of 'medically indigent' was primarily determined through total earnings by family size.[7]

Similar to present day circumstances, Baltimore at the time had extensive tracts of impoverished individuals, predominantly concentrated in the east and west of the city. Public finances simply

could not sustain a scheme in Baltimore that applied the state's definition of medical indigence. Consequently, only welfare recipients qualified for Baltimore's Medical Care Program (BMCP), which was administered by the Baltimore City Health Department. Almost 27,000 people entered the program when it began in June 1948.[8]

The fanfare that occurred in the 1940s is comparable to what is now being given to the PPACA (Patient Protection and Affordable Care Act, popularly known as Obamacare) in Maryland.

The centers of the Baltimore program were medical care clinics in six hospitals at Johns Hopkins, University of Maryland, South Baltimore General (now Harbor Hospital), Sinai, Provident, and Mercy. The clinics were intended to provide every eligible person with a thorough initial physical examination and laboratory work-up. The results were reported to the patient's chosen family physician that then provided home and office care. Physicians were paid on a per capita basis at a rate of $7 per patient per year regardless of whether the doctor saw a patient ten times or just once. When consultation by specialists was required, general practitioners were encouraged to refer patients to the clinic. In turn, the clinic would send patients to specialized hospital outpatient services.

The BMCP annual budget rose year-on-year. The initial state appropriation in 1948 was just under $0.5 million. In 1965, this had ballooned to $3.25 million. Pharmaceutical costs outstripped all other expenses. More than half a million prescriptions were issued in 1965, costing an average $1.30 per month per patient. The next largest expense, clinic visits, added up to just $1.11 per month.[9]

The state and city programs survived through a series of rising costs involving millions of dollars in state appropriations until the introduction of Medicare and

Dr. Edwin Crosby, Director Johns Hopkins Hospital; TJS Waxter, Director of Welfare, Baltimore City; Herbert Fallin, Baltimore City Budget Director; Mayor Thomas D'Alesandro; Huntingdon Williams, Baltimore City Health Commissioner; Dr. J. Wilfred Davis, Director Baltimore City Health Department Medical Care Section; Dr. Harry Chant, Medical Director of Johns Hopkins Hospital Medical Care Clinic; Dr. H Boyd Wylie, Dean of the University of Maryland Medical School . ***Photo courtesy of Baltimore City Health Department Annual Report 1948:35.***

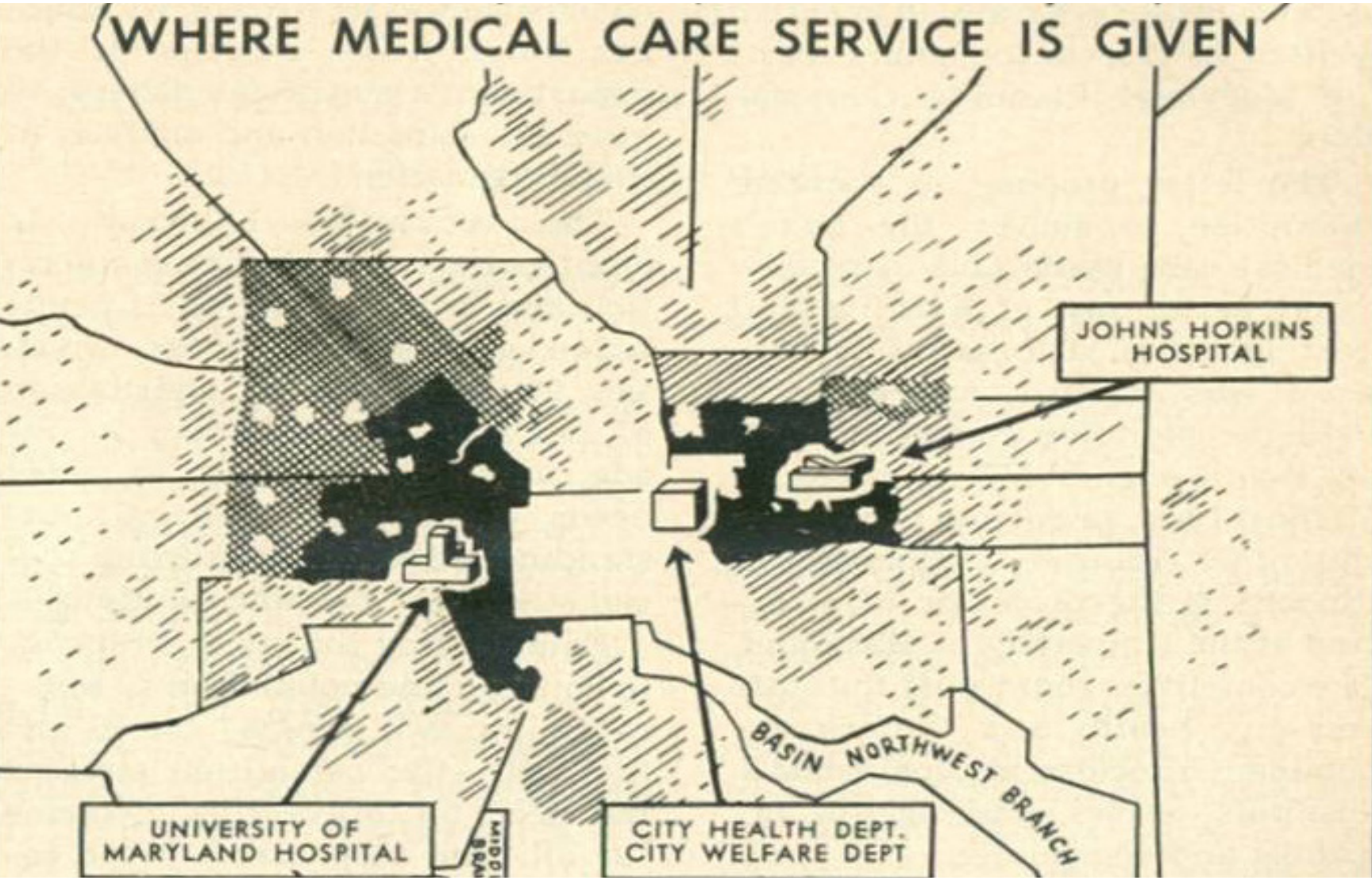
Medicaid in July 1966. By this point, more than 82,000 clients—about 8 percent of the city's inhabitants—were registered. Over 110,000 diagnostic tests, 35,000 clinical examinations, and almost 20,000 laboratory tests were being carried out annually.

Although, by the 1940s, many localities were already involved in the provision of health care services (for example, for tuberculosis, venereal disease, mental health, and maternal and child health), these sorts of programs were still seen as significant developments in post-war public health. On the one hand, they cemented the view that state and local public health departments should provide a basic level of service for society's poorest communities. Yet by screening people even when they were apparently well, publicly funded medical care was encroaching on private medicine.

The fanfare that occurred in the 1940s is comparable to what is now being given to the PPACA in Maryland. The American Journal of Public Health hailed the state program as a first in the U.S., which was significant at a time when the goal of "public health [was to] fulfill its destiny of meeting the total challenge of the people's health."[10] A vote by the Baltimore City Medical Society in 1947 overwhelmingly approved the city's proposals.[11]

This enthusiasm should not mask the fact that a number of salutary lessons can be learned from some of the programs' insurmountable problems. The first was the programs' vulnerability to the vagaries of economic cycles, industrial decline in the city, the increasing costs of medical care itself, and the politics of public finance. The state legislature cut funding on more than one occasion, emergency cutbacks in services were made, and waiting lists had to be temporarily introduced.[12]

In addition, the program in Baltimore never seriously addressed the unequal



University of Maryland and Johns Hopkins Hospitals and the distribution of welfare clients in Baltimore. ***Photo courtesy of Rivin AA. A new plan in Baltimore for indigent medical care. Hospitals 1948; 22:39.***

provision for African-Americans. It should be remembered that at that time white family physicians did not treat black patients.[13] In post-World War II Baltimore, there were 701 white people for every white physician; the corresponding number for African-Americans was almost four times as high at 2,675 people per physician.[14] In 1951, African-Americans constituted 24 percent of Baltimore's population, but made up 74 percent of the 26,000 welfare clients in the city and there were only 80 black family physicians.

The problem was compounded for the BCMP by the spatial concentration of poverty in the city, which made it difficult to locate private physicians willing to participate in the program. In the first months of the program, a family physician could not be found for at least 2,000 blacks who lived close to Johns Hopkins Hospital.[15] Even up until the 1960s, the BCMP workload for some black physicians was staggering: 30 percent of BMCP's 44,316 clients were registered with just 11 black physicians. Under such circumstances, it was extremely difficult to maintain anything close to a professionally high standard of health care for these black patients on the welfare rolls who disproportionately suffered compared to whites. The BMCP program never resolved this issue; the introduction of Medicare and Medicaid saved it from ever having to.

Seamless patient care never quite materialized in the BMCP. Clinics complained about the great variations in care provided by family physicians; family physicians grumbled about the failures of clinics in communicating the results of exams and consultations. In the mid-1950s, the *Baltimore Sun* reported that 'the vast majority' of participating practitioners were practically inactive in the clinics.[16] Not surprisingly, the continuity of care is one of the focal points of the new health co-op initiatives.

The physicians' reluctance was partly due to the capitated payments. Many doctors thought the payment of $7 per patient was too low and that the system represented a "trend towards socialism." When the BMCP shifted to a fee-for-service in 1962, thus bringing it into line with the payment system of the state's program, the number of participating physicians in Baltimore jumped from 285 to 510 in 1965. As history has shown, sufficient financial compensation for health care professionals is absolutely critical if standards of care are to be maintained.

Finally, it should be noted that these programs were not set up simply as an altruistic response to the health care needs of impoverished populations. By not participating in the program, private physicians were given a convenient and painless way of removing poor patients from their lists or at least recovering some of the costs these patients incurred.

Furthermore, it was explicitly recognized that these programs were "steps away from rather than toward socialized medicine" as maintained by Dr. Dean Roberts, the deputy state director of health in 1950. Roberts predicted that programs of the type adopted in Maryland would help stave off federal action in the medical field. When he spoke of indigent patients he said, "If we can meet their needs… that will take the pressure off for a sweeping federalized program."[17]

Roberts continues to be proven correct. The PPACA is social health insurance and will take millions of Americans off the 'uninsured' list; but it is a far cry from a socialized health care system. Evidence suggests that racial and ethnic minorities continue to receive lower quality care compared to non-minorities even when income and insurance status are controlled.[16] Moving forward, the public health sector needs to be persistent in resolving the clear disparities between the health care received by different races and ethnicities.

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It Takes Two: A Couple's Role in Controlling Population Growth

For many years, I have been concerned about the major problem of rapid population growth; we add about 75-80 million persons to the planet each year, or over 200,000 persons each day. In the early 1990s, I began sharing this concern on weekends with congregations of my religious group, the Religious Society of Friends or Quakers, in the Maryland/Virginia area. At the first Meeting I visited, I showed the film "What is the Limit?" which documented problems associated with human population growth (e.g. pollution, climate change, deforestation, etc.), featuring Lester Brown of Worldwatch Institute, Senator Al Gore, and the head of the Audubon Society at the time. After the film, a Friend shared that it was informative but all of the 'talking heads' were men even though fertility is mainly a women's concern. I took this to heart and at the next Meeting I visited I instead showed a new film called "Population and People of Faith," which took a women's perspective. It argued that studies show birth rates fall if women are simply given an education and economic opportunities–the film highlighted women around the world and in different professions. But afterwards, a man came up to me and asked, "This was good Stan, but what about the men?"

In 1994… I attended the United Nations International Conference on Population and Development in Cairo, at which 189 nations adopted a Plan of Action that put reproductive health at the forefront of concerns of the international community for the first time.

At that time, my wife and I attended a gathering that Quakers from around the country have every summer. After morning workshops, the afternoons consisted of free time and activities. My wife and I were walking around one afternoon and came upon the Men's Center. A man at the Center engaged me in conversation but ignored my wife, so we left. We then came to the Women's Center and the same thing happened but in reverse. Upon leaving, my wife remarked, "We need a People's Center!"

These two experiences were on my mind in 1994 when I attended the United Nations International Conference on Population and Development in Cairo, at which 189 nations adopted a Plan of Action that put reproductive health at the forefront of concerns of the international community for the first time.[1] Many women's groups were represented and a subtheme that seemed to pervade the conference was "women's rights and men's responsibilities." This seemed both correct and simultaneously incorrect, correct because we lived then and still live in a sexist/patriarchal world but it was at the same time incorrect because in an ideal world both women and men have both rights and responsibilities!

Upon my return to Johns Hopkins, I examined a variety of sexual and reproductive health components: sexual behavior, infertility, contraception, contraceptive sterilization, sexually transmitted diseases (including HIV), antenatal care, delivery care, breastfeeding, and abortion (due to politics and funding, there is not an agreed upon list of reproductive health components. Some researchers include violence against women as a component. For much the same reason, sexual health was separated from reproductive health at the Cairo conference). Clearly, for many of these components, both men and women are involved (e.g. sexual behavior, infertility, sexually transmitted infections) and for those with a focus on women (e.g. antenatal care, delivery care, breastfeeding, and abortion), male involvement could potentially have positive effects.

During a four-month mini-sabbatical, I did research on reproductive health and couples and subsequently wrote a literature review on the subject.[2] The first

thing I had to do was give a definition of a couple. The most general definition of a couple would be "any pair of individuals engaging in sexual activity" but for the purposes of reproductive health research, I restricted the definition in three ways: they must be heterosexual pairs, their sexual activity must include sexual intercourse, and persons engaging in one time casual or commercial sex are excluded. Thus a working definition of a couple is: any man-woman pair of reproductive age with an ongoing sexual relationship, where the definition of ongoing in terms of time may vary between contexts and where a sexual relationship implies coitus. Admittedly, for studies of sexually transmitted infections, a focus on sexual partners who are not couples by this definition is important but that is outside of the focus on reproduction.

In the review, I analyzed randomized studies of family planning interventions. In one study arm, wives and husbands were offered family planning counseling together, and in another arm, counseling was only offered to wives. These experimental studies were done in Ethiopia, Turkey, Bangladesh, and Taiwan.[3, 4, 5, 6] All studies except the one done in Taiwan showed significantly greater acceptance and/or continuation of contraception within the arm that gave counseling to the husbands and wives together. There were also longitudinal studies in 3 countries (Nigeria, Sweden, and USA) in which husbands and wives were each separately surveyed on whether they wanted more births or not.[7, 8, 9] Several years later, investigators determined whether there had been a subsequent birth or not. Table 1 shows these results and those from two other studies done since my review.[10, 11] In every case, note that the likelihood of a birth among couples with discordant fertility desires are intermediate between those of concordant couples in which both partners wanted or did not want another child. It follows that if only the fertility desires of women are considered, the prediction of future fertility is less accurate; the fertility desires of both partners are important in predicting whether the couple actually will have a birth in the prospective period or not.

It became clear to me that more reproductive health interventions addressing couples would be an important undertaking.

Reflecting on these results, it became clear to me that more reproductive health interventions addressing couples would be an important undertaking. The first study in this area of reproductive health was undertaken by a doctoral advisee, Britta Beenhakker, who, with my help, designed a study of husband involvement in antenatal care at the largest maternity hospital in Kathmandu, Nepal. Among 442 women who were accompanied by their husbands to antenatal care, she randomized them into two arms–those who received antenatal counseling alone (standard of care) and those who received it with their husbands (a male counselor was also present for these couples). She

It takes two: The author's grandson with his parents. ***Photos courtesy of Stan Becker.***

interviewed women a second time after delivery. Those in the couple services arm had a 25% higher rate of returning for their postpartum visit than those in the woman-alone group.[12]

A second study was done in Baltimore, Maryland at the local Planned Parenthood clinic.[13] The intake worker noted whether or not 774 women who presented for abortion in a given time period were accompanied by their partners. If she was, the woman was asked privately if she would like to have her partner included in the abortion and contraceptive education/counseling session that day. Of the women accompanied by partners, 42% accepted and had counseling as a couple. The couple counseling was largely a positive experience for both partners. A larger study, possibly with randomization to individual or couple counseling and follow-up, has yet to be done but could help determine if there is any effect on subsequent contraceptive use and/or repeat abortion incidence.

Another study was recently conducted with colleagues in Malawi where HIV prevalence among women and men of reproductive age was 10.6%. In the area of HIV prevention, reaching men is a major challenge. While women routinely have contact with the health system for maternal and child health services, males rarely visit health centers. Thus, the intervention included home-delivery of Couples Voluntary Counseling and Testing (CVCT) for HIV as well as couple counseling for family planning. This was a feasibility study, so there was no control arm. However, we revisited the couples one week later and asked another short questionnaire. Contraceptive use and condom use during their last sexual encounter had both increased significantly from baseline to follow-up.

Analyses of couple data present many possibilities and are richer than those using individual data, but there are also challenges. For example, if the husband reports the duration of marriage is 6 years and the wife reports 9 years, what does one conclude? Currently, I am working on a statistical matter for studies of couples and deriving an equation for the couple sampling weight that takes into account that response rates for couples are not a simple function of response rates for males and females.[14]

Returning to interventions, it is useful to consider three categories of couple interventions in regard to reproductive health. The first category includes interventions that we do not need any further studies for as it makes sense to implement them in any case. In this category are CVCT services as well as husbands' presence in labor and delivery where there is privacy and the wife wants him present. The second category includes interventions that make sense but need studies of cost-effectiveness to determine if it is worth the extra cost to involve both partners. This category contains the issues of the presence of male partners with women at the time of antenatal care and the arrangement of counseling for couples wishing to end childbearing with either a vasectomy or tubal sterilization. As an example of cost considerations, it is considerably less costly to have all male partners who accompany their wives to antenatal care listen to a counselor explain things to them in a group or see a video together about antenatal care than to hold separate counseling sessions for each couple.

Percentage of couples having a subsequent birth in longitudinal studies in five countries, according to joint desire for a/another child

Couples desire to bear a child	Nigeria (n=2662)	Sweden (n=933)	USA (n=1143)	Bangladesh* (n=3052)	Egypt (n=1659)
Neither wants	8	2	13	17	14
Only the husband wants	25	6	32	39	42
Only the wife wants	23		30	47	28
Both want	54	44	67	70	53

* Pregnancies for Bangladesh study

Some discussion questions from the course "Couples and Reproductive Health":

1. *How would power dynamics differ in married and unmarried (co-habiting) couples, if at all?*
2. *How would a clinician best deal with a couple presenting at a clinic in which one had an STI?*
3. *In what ways can men be involved in abortion decision-making?*
4. *What are possible good outcomes of couples Voluntary Counseling and Testing (VCT) for HIV? What are possible adverse outcomes?*

However, separate counseling offers the advantage of covering health risks unique to that couple (e.g. primagravida). The third category includes interventions where the effectiveness of involving both partners needs to be tested. One such intervention is the inclusion of male partners in abortion (and post-abortion contraceptive) counseling. Interestingly, many experimental studies of these interventions are relatively inexpensive to do. At the Planned Parenthood clinic, for example, we estimated that the counseling session only took on average 2-3 minutes longer when the male partner was included. It is also important to note that the category an intervention falls under may be context or country-specific.

An outgrowth of this work on couples has been a very enjoyable course offered at Johns Hopkins: "Couples and Reproductive Health." At its conception in 1997, it was a seminar course for doctoral and masters students. The students read select papers on the contributions of sociology, anthropology, psychology, and economics to couples and reproductive health in addition to readings on fertility decision-making, family planning use, and interventions. Most of the course revolves around discussion of specific questions, which allows the class to learn together. Some of the challenging questions are shown in Box 1. More recently, there has been an expanding interest in this course among undergraduate students.

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HISTORICAL PERSPECTIVE

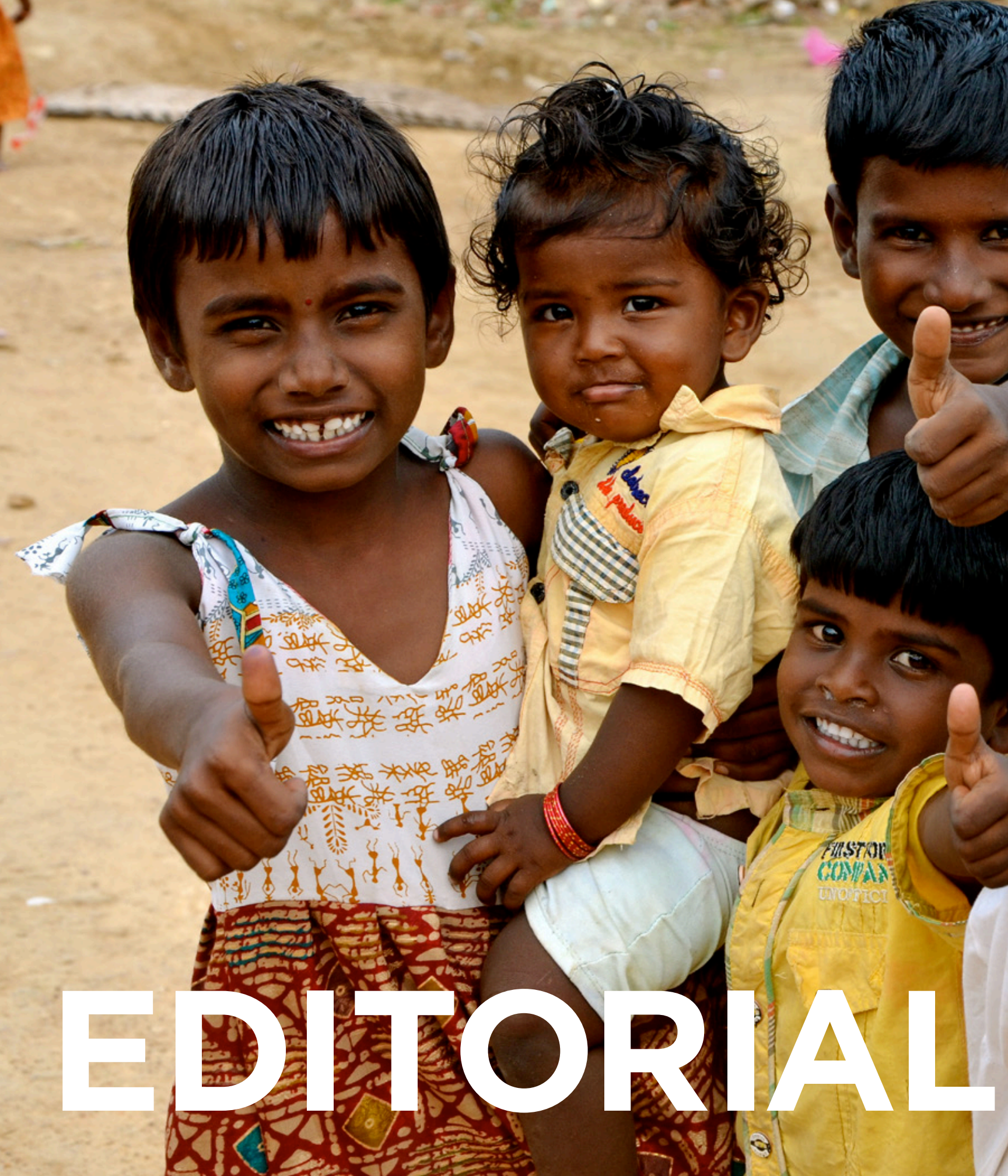
Did you know that on average, each woman in the US has exactly two children? This is just the right amount to replace herself and one man and thus maintain the same population. Over the past five decades, the total population of the world has been growing at a much slower rate than in the years before. Back in 1990, the total population of the world was 5.3 billion while the population of the world is currently 7.1 billion.

- "Fertility Rates(Children per Family)World Statistics." *Fertility Rates (Children per Family).* http://www.pregnantpause.org/numbers/fertility.htm. Accessed March 3, 2013.
- "Total Population of the World by Decade, 1950–2050". *Infoplease.* http://www.infoplease.com/ipaA0762181.html Accessed March 3, 2013

Taken outside of the Asian University for Women in Chittagong, Bangladesh - where I spent a year as a volunteer English instructor. I think the young man is trying to gauge my reaction to the smell of the waste, but by the end of the year it had become a familiar aroma during my daily commute to and from the university.. ***Photo courtesy of Lauren Villa.***

A little patient's pastime | Institute of Child Health & Government Hospital for Children | Egmore, Chennai, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Taken outside a cha stand in Calcutta, India. When the rickshaw drivers aren't endlessly peddling, they take rest on their rickshaws to enjoy a quite cup of cha. I love his expression and how he sort of posed for the picture.. ***Photo courtesy of Lauren Villa.***



EDITORIAL

A universal “thumbs-up” | Uncharted village slum near Chromepet, Tamil Nadu. ***Photo courtesy of Kavya Vaghul.***

Alexandra Guttentag | *Public Health Studies, Class of 2013*

Harm Reduction and its Public Health Potential

Harm reduction is briefly defined as "a set of practical strategies that reduce negative consequences of drug use, incorporating a spectrum of strategies from safer use, to managed use to abstinence."[1] It is an encompassing public health practice that has been employed for several decades. Along with program development, harm reduction encourages viewing individuals in a positive, worthy, and nonjudgmental way. Many argue that it is one of the most important public health practices and holds great promise, yet it still lacks widespread awareness and support.

The social policy concept of harm reduction started as a response to the spread of AIDS abroad, particularly in the Netherlands, Australia and Britain. Methadone programs, perhaps the most well-known harm reduction establishment, began in the 1960's and have been effective in helping drug users to abstain from the use of other, arguably more harmful, narcotics. Other examples of harm reduction include campaigns discouraging drunk driving and ads promoting responsible drinking.[2]

Currently, many harm reduction programs are focused on reducing needle sharing amongst drug users. According to Diane Riley and Patrick O'Hare's "Harm Reduction: Practice and Policy" article, more than 20% of reported AIDS cases in the United States are directly linked to injecting drugs; additionally, injection drug users make up over 30% of new HIV infections. The authors note that"[p]-rovision of sterile needles and syringes is a simple, inexpensive way to reduce the risk of spreading HIV infection."[3]

Because of the controversial nature of the treatments and users that harm reduction programs target, there is strong opposition to harm reduction funding. The United States government, for one, seems to side with opponents of the needle-exchange programs; there is currently a ban on federal funding for them. In 2009, TIME magazine addressed this issue in a Maia Szalavitz piece called "Why Obama Isn't Funding Needle Exchange Programs." The history of the funding ban began with Rep. Senator Jesse Helms in 1988. The Democrats have kept quiet about reversing it, despite Clinton almost lifting the ban in 1998 (he was convinced by Barry McCaffrey, a drug czar, to leave it—a decision which he is recorded as saying he 'regretted').[4]

The United States government, for one, seems to side with opponents of the needle-exchange programs; there is currently a ban on federal funding for them.

Some organizations around Johns Hopkins University are successfully using harm reduction techniques in practice. One such nonprofit in Baltimore City is Power Inside. The director, Jacqueline Robarge, added a street outreach component to the organization in 2004, following a grant from the assistance of the Baltimore City Office of Homeless Services. According to Power Inside, the street-outreach group became "the first harm reduction street outreach program funded by the Office of Homeless Services to reach women caught in the cycle of jail, homelessness, and the sex trade."

Power Inside itself employs several different methods of harm reduction. Employees distribute rubber tips on the streets for crack cocaine users, which aids in several ways. First, it prevents users from burning their lips on the pipes. Additionally, it protects against cuts from the glass, which can cause open wounds that can transmit diseases if users are sharing pipes. This is an example of a public health intervention that focuses on reducing the problems connected with drug use. If users are going to use, it is important that they do so in the safest way possible. While safe drug-use seems like an oxymoron, in this case, it helps reduce potentially dangerous consequences.

Additionally, a safe needle disposal bin inside the bathroom at Power Inside helps prevent the spread and reusing of soiled needles. Again, if users are going to use regardless, it is in the public's best interest to help them use in a safer, controlled manner. By accepting the fact that drug use exists and is rampant in some areas, harm reduction dictates that the next step is damage control. This idea helps Power Inside keep and attract clients. When clients realize that the organization is not out to incriminate, but rather to provide a safe place for people, they are more likely to use the shelter's additional services

that will likely help in the long run with drug treatment, housing, educational and psychological counseling.[5]

Needle exchange programs (NEPs), wherein users can safely exchange soiled needles for clean ones, are slowly gaining support. An article in JAIDS investigated whether enrollment in the Baltimore Needle Exchange Program was positively correlated with short-term reduction in risky injection practices. The results were highly significant, and the authors concluded that they "show rapid and mostly large reductions in a variety of injection drug use behaviors." The reductions in reusing syringes went down among the 221 participants, with a 13.8% decrease in likelihood after 6 months. Additionally, the personal choice of participants to "lend a syringe to a friend" decreased from 26.7% at baseline to 12% after the 6-month follow up period.[6]

Opponents of the program believe that NEPs result in increased drug use. In a sample of 8 reports surrounding injection frequency," three showed a reduction in injection frequency, four showed a mixed for neutral effect… and one initially recorded an increase in injection frequency."[7] Another concern is that the programs increase the availability of needles, thus promoting drug use. However, in the only "systematic study" addressing this question, the findings showed that ¨the opening of the NEP increased neither the proportion of drug users overall nor the proportion of those younger than 22 years."[7]

Opponents of NEPs also argue that the number of contaminated needles on city streets will increase as a result of these programs. In Baltimore, a systematic street survey showed "no increase in discarded needles following the opening of a[n NEP]."[7]

Currently, research is being carried out to assess the effectiveness of two-part interventions—combining harm reduction programs, such as needle exchange programs, with substance abuse treatment. JSAT published an article examining new information "about the responsiveness of syringe exchangers to routine substance abuse treatment." Within the Baltimore NEP, across all observation periods, "treatment enrolled subjects reported fewer days of opioid and cocaine use, number of drug injections, incarceration, and illegal behavior than No Treatment subjects. The authors conclude that the findings "provide good support for additional efforts to better integrate these important community-based interventions."[8]

The data support the positive effects on reducing the number of times syringes are used and/or shared and the positive correlation that exists between NEPs and substance abuse treatment effects. As far as other beneficial effects that needle exchange programs in tandem with substance abuse treatment programs may have on promoting safer sex and other healthy practices, the research remains to be completed. Nevertheless, from the available information, harm reduction has the potential to play a leading role in devising plans to combat pressing public health issues worldwide presently and in the future.

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A Moroccan kid exploring the mouth of the Hercules Cave (Grotte d'Hercule) at sunset. This mysterious cave is just outside the city of Tangiers, facing Cap Spartel--the famous geographical union of the Atlantic and Mediterranean. ***Photo courtesy of Kimia Ganjaei.***

Aleksandra Olekhnovich | *Public Health Studies, Class of 2015*

The Worksite Wellness Model

The idea of health has evolved from simply an absence of disease to a more holistic approach called wellness. Wellness is a relatively new concept as it focuses on both physical and mental health for optimal performance and functioning of an individual. Workplaces have begun to offer worksite wellness since employees spend a large number of waking hours at work and because the health of employees translates to increased productivity at work.

The University of Virginia (UVA) implemented the Hoo's Well@ health program in August 2011 to make a positive difference in the health of their employees. Hoo's Well@ is a comprehensive wellness program created in partnership with UVA's health insurance provider, Aetna. Since funding of this program comes from Aetna, only academic division and medical center employees (and spouses) that are currently covered by the UVA Health Plan are eligible for the benefits of this program. Hoo's Well@ aims to help its target population attain and maintain health by improving diet and nutrition, counseling tobacco users, managing stress, and losing weight. After all, good health starts with prevention. By mitigating health risks for heart disease, cancer, diabetes, and other illnesses, employees can work better and ultimately save UVA money.

The Hoo's Well@ program compares health progress in terms of Healthy People 2010 and other health benchmarks as determined by national health organizations. Healthy People 2010 identifies a wide range of public health priorities and specific, measurable objectives. This table (see right) shows how UVA employees compare to these objectives based on the results from the 2011 health assessments. As seen in the table, employees receive more exercise and have better levels of cholesterol than the target numbers. However, for the indicators of unhealthy weight, high-fat diet, tobacco use, and high blood pressure, employees are not meeting the standard. In the following years, Hoo's Well@ aims to bring the at-risk percentages down to the established targets. For instance, with tobacco use, UVA will implement premium increases for smokers in the third year of the program's operation in order to help reduce the percent at risk to the 12% target. Annual results from health assessments and biometric screenings provide meaningful data to tailor future wellness programming, eventually allowing measurement of behavior change to assess Return on Investment (ROI). It is assumed that the UVA Health Plan's wellness program will have a ROI of 3:1 due to the robust nature of the program

Health Indicator	Health People 2010- Current Status and Targets Nationwide	U.Va. Employee Status as Derived from Health Assessment
Inadequate exercise	**Current status:** 78% of adults exercise <3 times/week **Target:** 70% or less of adults exercise <3 times/week	65% at risk *better than target
Unhealthy weight	**Current status:** 67% of adults not at a healthy weight (BMI <18.5 or >24.9) **Target:** 40% or less of adults not at a healthy weight	62% at risk *not meeting target
High-Fat diet	**Current status:** 67% of adults consume a hi-fat diet (>50% of diet high in fat) **Target:** 25% or less of adults consume a hi-fat diet	47% at risk *not meeting target
Tobacco Use	**Current status:** 21% of adults smoke **Target:** 12% or less of adults smoke	26% at risk *not meeting target
High blood pressure	**Current status:** 30% of adults have high blood pressure (HBP) (systolic >120 and/or diastolic >80) **Target:** 16% or less of adults have HBP	48% at risk *not meeting target
High cholesterol	**Current status:** 16% of adults have high total cholesterol (TC) (high >240) **Target:** 17% or less of adults with high TC	4% at risk *better than target

"Values above including unhealthy weight, high blood pressure and high cholesterol were self-reported and may very from the clinically measured biometric results." – **Data from 2011-2012 Hoo's Well@ Mid-Year Report**

and the industry standards. The wellness budget for the 1st year of the program was 1 million dollars, for the 2nd year it was 1.3 million dollars, and for the 3rd year, it will be 1.4 million dollars. Thus, this worksite wellness is not only benefiting the employees but also UVA as an entity. ROI's can be used in convincing worksites to implement wellness, as initially the expenditures to create the programs can be relatively high. Education is key in implementing a worksite wellness program since people need to understand why their health is important and what they can do to improve their health. There were many programs, courses, and activities to educate people on their health and to entice them to get on board with the wellness program. Education itself is not simply going to draw people into the program, but rather we needed to market Hoo's Well@ as an attractive, social program just like any other new item or program. To begin with, we created informational helath publications with the aim to raise awareness of important health topics. These newsletters offered season-appropriate health tidbits on calories consumed and burned, common health problems and solutions, and interesting general health information and safety. After seeing the newsletters on the the bathroom stalls and water fountains, people would inquire what the Hoo's Well@ program was. This allowed us to reach out and personally invite the person to one of our programs. Monthly health tips and recipes for the website were updated in order to keep people engaged and motivated on the path to health. We advertised our on-site Weight Watchers workshops by targeting sites where workers had the highest percent at risk for indicator according to our health assessments. These marketing and educational initiatives paved the way for increased and continued participation and support of the program throughout the campus.

Our data show that people like quantitative measures of health as opposed to qualitative measures, such as eat 400 calories less instead of simply eat less.

Since obesity and related health conditions are such a large concern as determined by our health assessments, one of our most popular programs is the Hoo's Fit Walking Program. It provides pedometers free of charge for people to track their daily walking for a duration of six weeks. After they submit their results, we send them a free t-shirt to celebrate the completion of the program. Participants write in saying that the pedometers helped let them know that they were not moving enough on their own and needed additional daily exercise to reach the recommended number of steps. Counting steps provides a valuable and quantitative way to track health. Our data shows that people like quantitative measures of health as opposed to qualitative measures, such as eat 400 calories less instead of simply eat less. With the 10,000 steps or five miles goal per day, distances are mapped out around the UVA campus to inform people of how many miles they were averaging. These maps provided both paths and alternative routes people could take around the university to increase their steps and also the amount of steps for familiar sites, such as for a nurse around the hospital or for a researcher around the Fontaine research site.

As advocates for health, we have to lead by example, so the HR department, which houses the Hoo's Well@ program, had an 8-week challenge where 55 employees had to choose two nutritional improvements and exercise at least 30 minutes for five days a week. The nutritional improvements ranged from reducing the number of sugary drinks and desserts to drinking more water to eating more fruits and vegetables. For each time an individual completed a nutritional goal or exercised for at least 30 minutes, he or she would receive a point on their log. Although the tracking was individual, the challenge also provided a sense of community as the points were totaled per group to determine the winners. This collectivism encouraged team effort and celebrating each other's successes. By targeting each section that works together in HR, we were able to use the bandwagon approach to increase participation. Participants reported increased energy and weight loss. One participant reported a remarkable 20 pound weight loss over the two month period due to the reduction of soft drinks, smaller portions at dinner and lunch, and healthier food choices.

As wellness encompasses not only physical health but also mental health, participating staff and faculty were asked to take on the 21 Days of Happiness Challenge as part of the goal to improve overall mental health. This challenge has inspired participants to be happier by following the five steps from Shawn Achor's Tedtalk: three gratitudes, journaling, meditation, exercise, and random acts of kindness. Over a 21-day period, participants checked-off steps they completed every day and then recorded their overall happiness at the end of the week. Afterwards, we compiled the logs

A Kumarakom, Kerala local starts his day by fishing using a handmade pole. ***Photo courtesy of Pujan Dave.***

into an Excel spreadsheet to analyze trends in behavior over the period. Our data show that the most popular of the five was exercise, which was expected as it is the most familiar to most of the participants and many exercised pre-challenge. From the 21 participants, we were able to gather that the challenge increased happiness, as 81.0% of the participants reported increased happiness. Although some participants reported unchanged or decreased happiness, those participants reported high initial levels of happiness. By taking time to chart happiness levels, participants were more aware and in control of their feelings. The participants went on to spread the challenge to their colleagues and even reported that they will continue tracking. Some also expressed interest in continuing meditation and increasing random acts of kindness.

This experience highlighted the fact that much like anything else, a wellness culture needs to be developed with health so that people feel compelled to join the wellness movement at work. Analyzing data from records of participation in our programs has shown valuable insights into starting other worksite wellness programs. When beginning a worksite wellness initiative, there should be more emphasis on group progress rather than on personal progress. By focusing on group progress, it is easier to inspire a wellness culture and have greater participation and consequently greater results as more people are involved, as it seen as a group effort. Personal outreach, such as a personalized email as contrasted to a mass email, is preferable as a personal invite increases feelings of accountability. If a person feels a connection and genuine care from someone, he or she is more likely to want to try the program or join them in getting healthy. Additionally, incentives should be given to those with correct behavior instead of rewarding wrong behavior. For instance, smokers should have increased insurance premiums rather than be given incentives to quit smoking. Becoming healthy is a lifestyle change, which explains why it is so difficult to transition into healthy living for so many people. The establishment of a culture of wellness is the only way that businesses can really expect to see a return on their investments. The development of this culture will ensure that health initiatives are successful and long-term. These approaches to health in the University of Virginia can be extended to other Universities and corporations for similar health benefits. The managers set the tone for the work environment. Thus, it is very important to first get the managers on board so that they can encourage their employees to get motivated and involved. The managers should want to serve as role models, as ultimately, their behavior will increase the productivity and success of their workers, which will lead to greater results or higher profits for the company or organization.

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Elyse J. Thulin | *Psychology & Anthropology, Class of 2013*

Type 1 Diabetes: Affect, Adolescence, and Empathy

Recently, the term "diabetes" has become a household word to describe a metabolic disease having to do with diet, exercise and weight, a misnomer describing only Type 2 diabetes. In addition, the term also refers to the less acknowledged auto-immunogenic disease— Type 1 diabetes. Though Type 1 makes up only 5-10% of the estimated 17.9 million diagnosed cases of diabetes in the US, the individual monetary cost is disproportionately higher than that of Type 2 diabetes.[1] Additionally, the physical and emotional costs of Type 1 diabetes are high, given the complexity of Type 1 treatment regimens.

Unlike Type 2 diabetes, Type 1 does not discriminate based on an individual's body mass index (BMI), diet or socioeconomic status, instead it seems to occur somewhat randomly.[2] Although onset can be at any age, most diagnoses occur in childhood, adolescence or early adulthood.[3] Physicians and scientists theorize that multiple factors such as genetics, environment, and possibly viruses such as coxsackievirus, may be linked to an increased risk. However, no single factor has been found as a direct cause.[4,5,6]

[T]he term "diabetes" has become a household word to describe a metabolic disease . . . describing only Type 2 diabetes. The term "diabetes" also refers to the less acknowledged auto-immunogenic disease—Type 1 diabetes.

Type 1 diabetes is the result of the immune system mistakenly identifying an individual's own insulin-producing islet cells as foreign, subsequently attacking, and destroying them.[6] Once these islet cells are destroyed, insulin, the hormone responsible for transporting glucose into the body's cells to be used as energy, is no longer independently produced.[6] The absence of insulin causes increased sugar levels in the bloodstream, which can lead to life-threatening complications.

Treatment for diabetes is a replacement of the absent naturally occurring insulin with a synthetic version. In the last decade, biomedical research has produced two versions of insulin. The first is short-acting and takes effect within 15 minutes, peaking between 30 and 90 minutes.[7] Short-acting insulin is needed every time an individual ingests glucose or glucose derivatives (i.e. carbohydrates such as pasta) while their blood sugar normal, or when an individual needs an immediate increase in insulin due to high blood sugar.[7] The other type of insulin is a slow-release insulin formula that takes effect 1 hour after it is taken and functions to maintain a steady blood sugar for 20-26 hours.[7]

Insulin is administered by injection or through a cannula, a small tube connected to an insulin pump that stays in the skin for three to five days. Individuals who only use injections take 1 to 2 shots of

HISTORICAL PERSPECTIVE

Diabetes was once thought to be an acute condition with a low survival rate. Reducing the intake of sugar and strict diets were the only forms of treatment and if anything, only postponed a patient's life a few more years at most. As studies progressed, scientists noticed the correlation between pancreatic damage and diabetes, suggesting that the pancreas maintains glucose (sugar) levels. The pancreas produces a hormone, insulin, which was discovered to be the key component in glucose regulation. Since Frederick G. Banting and John Macelod's discovery of insulin, regular doses of insulin have been and will be used to treat diabetes in years to come.

• The Discovery of Insulin. http://www.nobelprize.org/educational/medicine/insulin/discovery-insulin.html. Nobelprize.org. Published February 2009. Accessed March 3, 2013

long-acting insulin and 3 to 5 shots of short-acting insulin, for a total of 4 to 8 injections a day. Individuals using insulin pumps do not need long acting insulin, as their pump gives small doses of short acting insulin every 3 to 5 minutes. However, they must dose for snacks and meals by dialing insulin amounts on their pumps.

The addition of insulin to the body is just one part of the process. An individual with Type 1 diabetes needs to monitor their blood sugar to dose insulin correctly. Therefore, most physicians recommend that Type 1 diabetics check their blood sugars frequently, usually between 4-6 times a day to maintain blood sugar levels around 70-130 mg/DL.[8] Recently, new technology has been engineered that can closely monitor blood sugars by showing the continuous rise and fall of an individual's blood sugar levels. This can be incredibly useful in identifying times of high and low blood sugars. Unfortunately, blood sugar levels are constantly changing based on several factors, such as exercise and hormone and stress levels. Therefore, blood glucose levels can fluctuate even under close supervision. This can lead to incredible frustration for diabetics, resulting in a lack of commitment in controlling their diabetes. However, neglect produces continuous abnormal blood glucose levels, resulting in the early onset and progression of diabetic retinopathy (loss of eyesight), diabetic neuropathy (loss of nerve sensation), diabetic nephropathy (kidney disease), and possible macrovascular disease (such as cardiovascular disease).[9] The possibility of such negative future prognoses causes dramatic emotional strain even for individuals who persist in controlling their disease.

Psychological research suggests that how a person feels towards his disease is greatly dependent on one's experience, support and emotional state. As diabetes is a life-long companion, the responsibility of treatment can be overwhelming. There are no "off" days. The concern associated with a chronic disease like diabetes often results in frustration, which can become acutely heightened during adolescence. As many teens start to comprehend the consequences of having a chronic illness, they may develop feelings of anger and deviate from treatment adherence. In addition to emotional consequences, hormone changes during adolescence can make it more challenging to control blood glucose levels. Therefore, it is not surprising that there is a trend of long term increased glucose levels during adolescence, resulting in dangerous future physical consequences. One way to diffuse this frustration is to have high levels of emotional support. For teens, parents and/or peers generally give this support.

Although several studies have found that parental monitoring during adolescence increases treatment adherence, studies also indicate that parental support has little to no impact on treatment adherence.[10] Higher levels of parental management can challenge the perceived independence of adolescents and increase parental stress, leading to conflict over diabetes within families.[10, 11, 12, 13] This deviation in support system is due to the fact that teens become less dependent on parental support and more dependent on peer interaction and encouragement during adolescent development.[14] For most teens, emotional support stems from peers; sadly, type 1 diabetes can lead to a lack of social acceptance for adolescent diabetics, due to a fundamental misunderstanding of the disease.[15] Encouragingly, research suggests that the small portion of diabetic teens who have well-educated peers to promote and support diabetes treatment adherence also experience greater overall control.[10] Unfortunately, the majority of teens do not have high levels of peer support.[10, 15] Often for these teens, treatment adherence is disregarded in favor of other activities, leading to poor control and higher long-term glucose levels.

One way to overcome a lack of peer support and encourage adolescents to take care of their diabetes and manage their treatment regimes is to find a source of empathetic support. The best form of empathy is found in those who have also experienced Type 1 diabetes, meaning fellow Type 1 diabetics. Unlike peer support, having support from fellow Type 1 diabetics can provide teens with the understanding that encourages them to overcome the emotional obstacles of a chronic illness. It is a great comfort to be able to empathize with another individual who truly understands what it feels like to have diabetes. Large gatherings, such as Type 1 diabetes camps, can be great sources of empathetic support and can provide adolescents with an opportunity to meet adult diabetics who can serve as mentors. These gatherings also enable adolescents to make friends with peers who are also experiencing similar obstacles. In addition to providing support, physicians and nurses can also educate youth, teaching them new strategies to care for their disease. Although there is a deficit of literature on empathetic support for type 1 diabetes, individuals who have experienced this first hand can attest to the life-long benefits of greater disease acceptance and persistence in treatment adherence. Empathetic support can encourage adolescents to become more committed to controlling their diabetes and provides a support network to do so.

Type 1 diabetes is an expensive and challenging disease with a high risk of potential future physical complications. Individuals need to maintain control of their blood glucose levels, but adolescents often struggle with the weight of the responsibility coupled with their physical, social, and emotional changes in their transition to adulthood. Although peer sympathetic support and understanding is important, empathetic support coming from fellow diabetics can greatly enable

adolescents who are struggling with diabetes to live healthier and happier lives.

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City Center of Bangkok. ***Photo courtesy of Hyunju Kim.***

Seulah Rebecca Choi | *Materials Science and Engineering & Molecular and Cellular Biology, Class of 2013*

Swaziland: The Last Absolute Kingdom

In May 2009, the last month of my senior year in high school, we were required to do a "Senior Externship": outside classroom work for one month. People did various things, such as shadowing a surgeon, working at a law office, interning with National Geography in Iceland, or simply working at a bakery. In an all-girl prep school where more than half the students attended all 14 years, many had planned for and dreamed of "the Senior Externship" for a long time. However, I had come to the United States and only started attending the school in the 9th grade, so I had no idea what to do. When my advisor showed me the many intriguing activity posters that previous students had done, one picture caught my eye: a 7 or 8-year-old Kenyan kid wearing a big happy smile. I instantly made up my mind to go to Africa.

When I first talked to my parents, they were against my idea. They thought I was too young to go to Africa by myself and that the country was not safe enough. But my dad, having grown sick of my nagging, finally allowed me to go and even got in touch with his college friend (Dr. Kim), who had moved to Swaziland to serve the sick and disadvantaged.

On May 4th, 2009, I landed in the kingdom of Swaziland, the last remaining absolute monarchy in the world. Dr. Kim worked at a Korean NGO, which had three subsidiary centers: a hospital, a kindergarten/pre-school, and a women's center. There was only one doctor at the hospital, and since it was a free medical center, there were always sick people to see. The pre-school had a good reputation, even hosting children of the king, but most of the children came from very poor families. The women's center was built to help African women be self-sufficient. I was taken back that the center was not just giving food and clothing to the Africans, but it was also trying to help them become independent. Basically, the NGO taught women how to use sewing machines so they could make school uniforms to sell. They also taught English to young adults. At first, teachers were volunteers from Korea, but now all teachers and kitchen workers are local. The chief of the NGO stated that he did not want to change the townspeople though he planned for the NGO to help for an extended period of time. He did not want the people to have the mindset that they could consistently get free food or medicine, as it would make them dependent and end up hurting their lives in the end.

[I]ronically, there was widespread obesity although the country was known to be suffering from a scarcity of food. The concept of mealtime did not exist, and people continued to eat when they had nothing to do.

However, he mentioned some things that we would have to change while still respecting their lifestyle. For instance, ironically, there was widespread obesity although the country was known to be suffering from a scarcity of food. The concept of mealtime did not exist, and people continued to eat when they had nothing to do. The kindergarten was trying hard to teach this concept to kids so that the behavior could be stopped in the next generation. The country was also reported as having an alarmingly high rate of AIDS patients, which continued to increase. This fact was due not only to their polygamous customs, but also because they didn't like to use condoms for religious reasons.

I mostly worked at the hospital preparing medicine, filling the prescriptions, or cleaning the waiting room. The hospital was only open from 7am to 1pm, so in the afternoons, I played soccer with kindergarteners or chatted with the ladies at the women's center. It was amazing that I could understand what they were trying to say with their facial expressions and outward motions, even though they did not speak English. The conversations were not fast because they had to repeat things multiple times to make me understand, but the conversations made me get closer to them quickly. It also made me realize that you

Swaziland natives performing a cultural reed dance.
Photo courtesy of Seulah Rebecca Choi.

do not have to speak the same language in order to become friends with people who are drastically different than you. By making eye contact instead of focusing on language, one can concentrate more on what they are trying to say and this really helps me to forge a unique connection.

Other than the routine work, I had a chance to visit a house full of children. The family consisted of a mother with 8 kids belonging to three different biological fathers. Yet none of the fathers ever came back, so she was essentially a single mom. It was very shocking because the kids were wearing shirts that were very dirty and had many holes. I didn't understand because they looked well-dressed at kindergarten, but Dr. Kim later explained to me that all the kids wore their best clothes at school. Most of the time they did not dress nicely in order to save their best clothes and shoes so that they would last. Can you imagine walking in bare feet all the time just to keep your shoes nice? I felt shameful that I have bought new pairs of shoes just because of design, instead of wearing pairs of shoes until they wore out. Once again, I realized just how spoiled I was. Not only that, there was no bathroom or electricity. The latter was the reason why the kids came to kindergarten at 6 am. Dr. Kim said the kids come to kindergarten when the sun rises, and they sleep before nightfall—a common practice that existed only before electricity was discovered.

One thing that frustrated me was seeing many luxury cars, such as Mercedes and new edition 7 series BMWs, while most people were living without electricity and worrying about food for the next day. Downtown, I could easily find franchise super markets, internet cafes, cell-phone users, and even KFC. There was a huge discrepancy between the rich and the poor.

By the end of the month, I became friends with many people coming to the center. The best skill that I used was my open attitude. I tried hard to learn their language. They thought it was cute when I committed mistakes trying to repeat what they taught me. They also liked when I tried their foods. Even when I did not like a particular food, they seemed to be happy that at least I tried.

I did not make a big impact and I may just be remembered as one Asian girl who came and left; but, I still think it was worthy. Last year, when I said I wanted to go again, my mom told me it would be more helpful for them if I donate $2500 instead of spending the money buying an airline ticket to get there. But I view it differently. I can definitely say that my view of the world and my future goals were changed after my trip. And since then, I have come to truly enjoy volunteering. I can say this experience really made me become a person who wants to serve others. It was a valuable experience, and I learned through helping others the true meaning of the word "gratitude". Although my initial motivation was simply a curiosity about Africa, being exposed in this kind of environment provoked me to change for the better.

HISTORICAL PERSPECTIVE

Did you know that English is the second language of Swaziland? About 75% of the population works in subsistence farming while 60% of the population live on less than $1.25 USD per day. Swaziland holds the highest infection rate for HIV in the world at 26.1%. According to the CIA World Factbook, Swaziland has the lowest life expectancy in the world with about 49 years.

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