

EpidemicProportions

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One World, One Crisis

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LETTER FROM THE EDITORS

Public health is difficult to define - its goals are wide-reaching and encompass every facet of human health and well-being. What connects the gap between textbooks and reality are the hands-on experiences and interactions, which help us to appreciate the larger picture and to realize what is at stake. With every experience, public health takes on new meanings: our eyes become softer, our hands tougher, and our hearts stronger.

During the summer of 2009, I traveled to western Ghana as part of a campaign dedicated to the eradication of childhood intestinal worms. One hot afternoon, I happened to drop a handful of graham cracker crumbs leftover from a morning snack. A malnourished Ghanaian girl immediately dropped to her knees and devoured them as if they were the last bits of food on earth. The promotion of public health means assuring that every human being receives adequate nutrition so that they do not find themselves in such gut-wrenching states of desperation. I am not sure that I will ever forget that little girl, and as awful as the situation was, I do not ever want to. She gave me a sense of urgency and a need for action that will remain with me for the rest of my life, and for that, I am eternally grateful. Supporting advancements in public health does not require an advanced degree or ask that we travel to remote parts of the world. It simply asks that we have compassion for the dignity of others, and that we respect their right to life. I cannot think of a more exemplary way to champion the field of public health than to ensure that the life of a dying individual is made comfortable. Thousands of miles away from me, my co-editor, Jae Kim, spent the summer of 2009 working at a hospice facility in Ohio, and can speak to how her experiences relate to the field of public health.

As a longtime volunteer, my service in a hospice unit was a natural extension of my desire to help others. To help us understand what others go through while staying in the hospice unit, we wrote our own wills and planned our own funerals during training sessions. Training fell short of reality, however. Saying the right thing was not nearly as important as simply being there to provide comfort. Sometimes, I would keep vigil of a patient so that the relative or caretaker could get some much-needed rest. Sitting alone with a dying person is a most humbling experience. I still cannot forget their bright eyes, which defied their weak limbs and translucent, blue skin. Although unspoken, the most powerful lesson I received was this: every person has the right to die the way he or she wants. The numerous individuals who actively safeguard those rights include physicians, nurses, and volunteers who give the best medical attention needed, as well as the policymakers who pass laws to protect the privileges of the dying and deceased. It is clear that public health only succeeds when there is a network of individuals who share a universal goal of improving the lives of others without sacrificing their dignity.

The world needs public health now more than ever. Our cover title, “One World, One Crisis” by no means indicates that there is only one issue, and only one solution. Rather, we see global public health as an entity that faces problems head-on with a shared commitment to save lives. There are multiple fronts, but there is one common goal that unites us all. We first began this issue on a quest to showcase public health issues around the world, continent by continent. We realize, however, that by sharing such a broad range of public health issues, you as the reader may be uncertain as to which one is the most important, uncertain as to what it means to fight in the name of public health. Should you find yourself confused by the meaning of public health, imagine holding the hand of a dying person in the hopes of allowing them a bit of comfort as they leave this world behind. Imagine that Ghanaian girl no longer needing crumbs to survive.

Imagine making a positive difference in another person’s life. That is public health.

Sending our best,



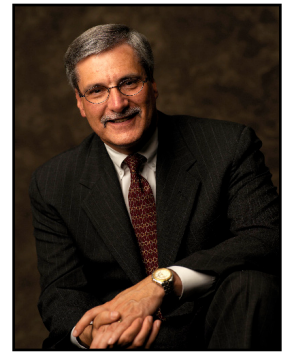
Jae Kim
Editor-in-Chief



Kevin Brown
Editor-in-Chief

DEAN'S ADDRESS

Michael J. Klag, M.D., MPH
Johns Hopkins Bloomberg School of Public Health



For those of us who work in public health, there is a heart wrenching reality that we face—the worse things get, the more we are needed. When the earth shook under Port-au-Prince on January 12, 2010, things could not have gotten worse for the Haitian people. Already a nation facing crippling poverty, the 7.0 magnitude earthquake reduced Haiti's capital to rubble, instantly killing thousands and leaving countless more trapped. Now over a month after the earthquake, the weight of the devastation is almost unbearable. Consider these figures carefully—over 200,000 dead and hundreds of thousands more homeless. While the magnitude of the disaster may be incomprehensible, our responsibilities as public health researchers and practitioners are not. Our skills, knowledge and experience are needed now more than ever, not only in Haiti, but throughout the world over.

The Bloomberg School of Public Health had four students in Haiti when the earthquake hit. The four students were in a region outside of Port-au-Prince at the time as part of a UNICEF project gathering data on the country's endemic iodine deficiency. In what is the hallmark of our school's faculty, staff and students, these four went right to work. They joined forces with relief groups and doctors in providing basic medical care and helped to establish relief camps on soccer fields and even on the Prime Minister's lawn. They also worked to create and organize data to quantify needs, to delineate the status of food and water and to catalogue medicine shortages that could then be directed to organizations bringing in supplies. Shortly after returning to Baltimore, these four students resumed their work, raising funds for relief efforts and to meet Haiti's long-term needs.

Soon after the earthquake, members of the Johns Hopkins "GO Team" were dispatched to Haiti to provide critical medical care for earthquake victims. Formed by the Johns Hopkins Office of Critical Event Preparedness and Response (CEPAR), the GO Team is a unit of 185 health care providers trained to respond to disasters. Dr. Tom Kirsch, a physician at Johns Hopkins Hospital and co-director of the Bloomberg School's Center for Refugee and Disaster Response, led the first GO Team unit that traveled to Haiti. His reports from Port-au-Prince not only document the herculean effort of emergency responders—at one point the team saw 470 patients in one day—but they also illuminate the wider-reaching need for public health.

Jean Ford, MD, a native of Haiti and a faculty member in the Department of Epidemiology at the Bloomberg School, also answered the call to aid victims of the earthquake. After landing in Port-au-Prince, Dr. Ford went directly to a field hospital and started seeing patients immediately. Without the cutting edge technology that is easily taken for granted throughout much of the world, Dr. Ford and others worked miracles in healing wounds and saving lives. But even with the severity and the sheer number of injuries, Dr. Ford worries that the psychological trauma may be even more profound than the physical injuries. He tells heartbreaking stories of children who witnessed their parents' deaths and of the perpetually stunned countenances of adults. Yet, despite the pain and anguish caused by the earthquake, Dr. Ford gives me great hope when he describes the great optimism of so many Haitians even in the face of such devastation. What is more, as a doctor and an epidemiologist, Dr. Ford not only has the tools to heal immediate injuries but also to assist with Haiti's long-term health issues as he looks to return to help with the rebuilding.

All in all, the response to the earthquake in Haiti represents the dire need for qualified and dedicated public health graduates. With both the Bloomberg School of Public Health and the Johns Hopkins undergraduate program in public health, we are leading the world in this effort. By definition and by necessity, public health covers a broad array of disciplines, and because we focus on population-based issues, we deal with big problems. Public health researchers and practitioners work on everything from injury prevention to mental health to malaria eradication. But through our various efforts, we share a common perspective and a common goal: to bring a world of knowledge together to save lives—millions at a time. Now let's get to work!

A handwritten signature in black ink that reads "Michael J. Klag". The signature is written in a cursive, flowing style.

Michael J. Klag

COVER LETTER



Susan Krenn, Director
Johns Hopkins Bloomberg School of Public Health

Information is a critical component of each area of public health practice discussed in this issue—reproductive health, HIV/AIDS treatment, tobacco control, health system strengthening, and TB services. Imagine trying to deliver antiretroviral therapy (ART) services to people who don't know where to go, when to go, why to go or how much it costs; perhaps they are afraid they will be stigmatized or believe they will be treated badly by the health worker, while they are still coping with the knowledge that they have a deadly disease. To call such a cluster of challenges simply “information” needs is, of course, an oversimplification. In fact, to confront issues like these, we use and continue to develop a dynamic, complex and wonderfully exciting body of theories, models and approaches—the field of Social and Behavior Change Communication (SBCC).

SBCC is the softer, often more challenging and harder to measure companion to the delivery of health services and products. It draws from many disciplines—sociology, social psychology, journalism, adult learning, marketing, anthropology, and communication. It involves both science (epidemiology, research and theory) and art (music, drama, media production). SBCC includes community mobilization, policy reform and structural change, social marketing, mass media campaigns, “below the line” consumer education, interpersonal communication and counseling, research, monitoring and evaluation, and knowledge management. While practitioners around the world may split hairs over what exactly constitutes SBCC, we generally agree that we are engaged in using strategic communication to help people around the world make better health choices for themselves, their families and their communities.

CCP is a leader in the field of public health and a pioneer in social and behavior change communication for health and a leader in the field. Our approach recognizes that effective communication is grounded in a particular socio-ecological context that includes the media, the health care system, the community, the family and the individual. We specialize in identifying and understanding what is needed to change behavior within these complex systems and we develop bold and creative strategies and unique and comprehensive communication approaches to catalyze change.

Epidemic Proportions is in itself an excellent example of catalyzing change, providing critical information and contributing to the field of study and public health culture at the undergraduate level. As you review the impressive achievements of the young scholars represented in this edition, and as they in turn find their way into positions of influence and authority, let me invite everyone to consider communication as a powerful and valuable driver of exciting and ambitious social change within the public health arena.

A handwritten signature in black ink, appearing to read 'Susan Krenn', written in a cursive style.

Susan Krenn
Director
Center for Communication Programs

Towards Global Eradication of Malaria

An Analysis of Current International Malaria Treatment Standards and Key Interventions in Post-Conflict Sierra Leone

Graham Ellis, Class of 2010

Philosophy

INTRODUCTION

The West African nation of Sierra Leone took center-stage during the fierce civil war between government forces and rebels from the Revolutionary United Front (RUF). The 11 year conflict left the country with a decimated infrastructure; the few health centers present pre-war were rendered virtually non-operational. The war had left urban areas prime sites for epidemics such as malaria, a disease that had historically burdened the region even before military conflicts. The most recent estimates by the International Committee of the Red Cross hold malaria responsible for 40.3% of all outpatient cases in hospitals and community health centers today.¹

EPIDEMIOLOGICAL BACKGROUND

Malaria is an infectious disease caused by a protozoan parasite of the Plasmodium genus and is spread to humans almost exclusively through the female Anopheles mosquito. Malaria is widespread throughout the tropics and is endemic in Sierra Leone. The parasite Plasmodium falciparum accounts for close to 90% of infection in Sierra Leone, although occasional infections are caused by P. Malariae and P. Ovale. The principle mosquito species serving as vectors for the parasite in

the region are Anopheles gambiae s.l., Anopheles funestus, and Anopheles melas.

Transmission of the disease occurs year round, although peaks can be observed at the beginning and end of the rainy season (May-November) and approximately 100% of the population is at risk. While the incidence of clinical malaria cases is reported to be 34.9/1000 in 2007,² the actual instance of infection is much higher, the discrepancy due to the high number of untreated cases and of poor record-

keeping in health centers.³

CURRENT POLICIES AND STRATEGIES

The standards for the treatment, prevention, and control of malaria worldwide have been set by the World Health Organization. While variations in these policies and strategies are observed among government organizations, NGOs, and the private sector, policies set forth by the WHO stand as the rule against which the current state of treatment in Sierra Leone is measured.

WHO Malaria Vector Control: Integrated Vector Management

The most important and effective strategy for the treatment of an endemic disease such as malaria is an aggressive policy of prevention. Currently, the WHO places a great emphasis on three strategies for preventing the transmission of the Plasmodium parasite: the use of Insecticide-Treated Nets (ITNs), the application of Indoor Residual Spraying (IRS), and a group

The old methods of clinical diagnosis have proved to be vastly inaccurate on the scale of 25% of patients diagnosed with malaria suffering from another illness for which the malaria treatment would be of no help.

of various environmental and personal protective measures. The WHO combines these strategies into a systematic approach to vector management based on the unique conditions found in various global regions called Integrated Vector Management, and is one of the four basic elements of the Global Malaria Control Strategy.⁴

Environmental and Personal Protective Measures

Preceding the world eradication campaign of 1955, malaria treatment focused almost exclusively on the lar-

Estimates (MERG method used)	Population	5,742,694
	Fever cases	8,735,966
	Malaria cases	2,272,651
	Malaria deaths	8,857
Reported probable and confirmed	Outpatient malaria cases	160,66
	Inpatient malaria cases	6,856
	Malaria attributed deaths	70
	Cases at community level	0
Reported laboratory confirmed	Microscopy slides/RDTS taken	16,973
	Microscopy slides/RDTS positive	4,932
	<i>P. falciparum</i>	3,495
	<i>P. vivax</i>	0
	Mixed infections	0

Figure 1: 2006 malaria statistics, as reported in the 2008 WHO World Malaria Report

val stage, promoting efforts such as the destruction of mosquito habitats to control the mosquito population of a specific area. After 1955, DDT was more broadly used and theoretically could have expanded the campaign to extensive rural areas. However, concerns over the safety of such high-volume spraying have demoted this method from current strategies of choice. While methods of environmental control such as larviciding water surfaces, intermittent irrigation, sluicing, and general environmental sanitation remain important strategies for malaria prevention, their effectiveness is greatly limited by cost and the need for highly disciplined campaigns of extensive implementation. IRS and the use of ITNs as preventative measures are more broadly applicable geographically and economically than community/ecology-specific methods directed toward larvae or personal protection.

Insecticide-Treated Nets (ITNs)

The use of insecticide-treated bed nets is currently the most accepted method of prevention by the WHO. Not only do these nets provide a high rate of personal protection if used properly, but recently-developed nets treated

with pyrethroids have long residual action and low mammalian toxicity and thereby act with insecticidal effects to actually eliminate vectors. Mosquitoes are drawn into a home or sleeping area by the sleeping individual and come in contact with the net which thereby exposes them to a toxic insecticide. Community-wide use of ITNs leads to large-scale killing of mosquitoes and increases the protective effect of the net by greater than 50% over an untreated net.⁵ The WHO has found this to be a highly cost-effective method of prevention and while re-treatment of the nets remains a necessity and therefore key challenge to effective implementation, recent development of Long Lasting Insecticidal Nets (LLINs) may increase the efficacy of ITNs. Resistance to insecticides is of continual concern, and monitoring is recommended to be part of any ITN program.⁵

Indoor Residual Spraying (IRS)

The WHO purports the application of IRS as the “most widely used malaria vector control method”⁵ globally and advocates its use in the tropical West African region where Sierra Leone lies. However, while the use of ITNs focuses largely on personal protection, the effectiveness of IRS is almost

exclusive to the community. More than any other preventative measure, the challenges and effectiveness of IRS are unique to each steady-state ecosystem. The WHO suggests that many nations (such as Sierra Leone) may lack the necessary infrastructure in both urban and rural areas to achieve the required high percentage of national involvement to be effective. However, if implemented properly, IRS can be at least as, if not more effective as ITNs.

WHO Malaria Treatment Recommendations

The treatment of malaria in human beings largely depends upon the patient’s age and physical condition and upon the stage of the infection. The WHO treatment policy varies depending upon a diagnosis of Uncomplicated or Severe Malaria, or if the patient is an infant or a pregnant woman. While an emphasis is placed on the need for a diagnosis within 24 hours of the onset of symptoms, this is frequently not possible in rural areas or areas without required health systems in place (much of Sierra Leone). The WHO recognizes this fact and the fact that the availability of recommended antimalarial drugs is also a principle concern in nations such as Sierra Leone. They advocate that their policies be followed when possible.

CURRENT PRIMARY INTERVENTIONS

The Global Fund

The Global Fund to Fight AIDS, TB and Malaria was created in 2002 with administrative assistance from the WHO, but has been fully autonomous since 1 January 2009. According to their website, the Global Fund is, “a global public/private partnership dedicated to attracting and disbursing ad-

ditional resources to prevent and treat HIV/AIDS, Malaria and Tuberculosis".⁶ The organization, with an approved budget of \$11.4 billion USD, partners governments, NGOs, members of the private sector, and affected communities worldwide to provide funding from international donors for the prevention and treatment of said maladies. In the malaria division specifically, the Global Fund seeks to "fill gaps" in current efforts to treat and prevent infection and claims to provide three-fourths of all international funding for malaria programs. In Sierra Leone, funding is divided between two grants awarded to the Sierra Leone Red Cross Society and to the Sierra Leone Ministry of Health and Sanitation.

Sierra Leone Red Cross Society

The Sierra Leone Red Cross Society serves as the figurehead for several aid and government organizations which were awarded a grant of \$8.9 million USD on 1 May 2005 to begin the National Malaria Control Programme. According to the grant proposal,⁷ this program is based on the Roll Back Malaria initiative to reduce half of the burden of malaria worldwide between 2000 and 2010 (see below). The proposal seeks to fill gaps in the national response to malaria through three principle interventions: (1) to increase treatment access for all malaria patients to 60% in selected districts, (2) to increase the percentage of children under five years of age and pregnant women sleeping under ITNs from 6.6% to 30% and from 2.1% to 40% respectively in selected districts, and (3) to attain 60% coverage of pregnant women receiving Intermittent Preventative Therapy (IPT) in selected districts.⁷ In addition to these general objectives, the program seeks to provide ACTs at an affordable cost to the general population and at no cost at

all to vulnerable groups covered under the national exemptions policy.

Sierra Leone Ministry of Health and Sanitation

The Sierra Leone Ministry of Health and Sanitation was awarded a grant of \$10 million USD to begin a program based on the National Strategic Plan for Malaria Prevention and Control and seeks to address the malaria epidemic by, "scaling up community based interventions, particularly home-based management of malaria. The proposal gives a general estimate that malaria morbidity will be reduced by 50%

Community-wide use of ITNs leads to large-scale killing of mosquitoes and increases the protective effect of the net by greater than 50% over an untreated net.

and mortality by 25% in the entire population by the end of the interventions in 2013.⁸ Its specific objectives are fourfold: (1) to increase access to prompt and appropriate treatment of malaria among children under five to 80% coverage through scaling up the Home Management of Malaria Strategy (HMM), (2) to increase access to IPT among pregnant women to 80% coverage, (3) to increase the use of ITNs by children under five and by pregnant women to 80% coverage, and (4) to strengthen the technical and managerial capacity for malaria control at the national and district levels.⁸ An emphasis is placed on the implementation of the HMM program including training, access to medicines, and monitoring per WHO recommendations.

Roll Back Malaria Program (RBM)

The Roll Back Malaria Program was launched in 1998 as a joint effort to fight malaria globally by the WHO, UNICEF, UNDP, and the World

Bank. It seeks to reach the UN Millennium Development Goals for 2015 (see below) by promoting investment in health systems and incorporating malaria control into all national multi-sector activities until, "malaria is no longer a major cause of mortality and no longer a barrier to social and economic development and growth anywhere in the world."²

Principle NGOs

Due to the major infrastructure deficits in Sierra Leone, a large portion of the healthcare burden falls on non-governmental organizations, in-

ternational aid partners and religious organizations. The most recent information available states that these organizations run a total of 22 mission hospitals or clinics in the country.¹⁰ One of the primary actors is Médecins Sans Frontières (MSF), which has worked in Sierra Leone since 1986 and currently focuses its malaria efforts in the southern districts of Bo and Pujehun, which include the support of 30 rural health clinics in their training of community malaria workers, the administration of rapid diagnostic tests (RDTs) and ACT regimens, and the distribution of ITNs.¹¹ The organization focuses its efforts on removing the financial barriers to healthcare by providing treatment and antimalarial drugs completely free of charge.

TREATMENT EVALUATIONS

While technical evaluations of past and present malaria prevention and treatment campaigns in Sierra Leone are limited due to a lack of reliable data

and monitoring programs, several independent organizations recognize the necessity of monitoring these programs in order to most effectively address this issue.

The efficacies of three antimalarial drugs, Chloroquine (CQ), Sulfadoxine-pyrimethamine (SP), and Amodiaquine (AQ), were analyzed in the cities of Freetown, Kabala, Karlahun, Makeni, and Matruby by an independent research team in 2005.¹² After an analysis of data from full 28-day treatment programs, CQ failed, due to drug resistance, to cure most children or even to temporarily improve their condition. It was also found that SP resistance is well advanced in the country. However, AQ resistance seemed to remain relatively stable and acceptably efficacious. The group reported that a recommendation was made to replace CQ with AS or AQ as the preferred first-line treatment in Sierra Leone at a meeting with the Ministry of Health and Sanitation in March 2007. The report concludes that although it seems these recommendations have been adopted in policy with the Ministry of Health and Sanitation, their implementation in the field has not yet been sufficiently established.

Additionally, another article in July 2006 suggested that the efficacy of the ACT artesunate + amodiaquine regimen may also be in jeopardy. According to this collaboration report by MSF – Paris and the Ministry of Health and Sanitation, the therapeutic efficacy in the Kailahun district for children under five after a 14-day analysis was found to be 98.2%, yet fell to 84.5% after 28 days.¹³ The report states that, “the day 28 efficacy was far from what we would expect from a newly introduced treatment, and the high re-infection rate suggested that this combination provided little prophylactic effect.”

RECOMMENDATIONS

While data on current malaria treatment policies and their evaluations in Sierra Leone is limited, several recommendations can be made based on the currently available data in order to assist the government and non-governmental organizations in reaching the world health goals enumerated above.

Address Discrepancies between MSF recommendations and WHO guidelines

The work of Médecins Sans Frontières, according to their Malaria Report of September 2008, focuses on two principle campaigns: removing the financial barrier to treatment for the poorest of the population, and providing efficient and quality diagnoses for suspected malaria patients.¹⁴ It is MSF’s policy to provide all malaria services free of charge as a means of increasing access to treatment for the poorest members of the community. While the WHO advocates subsidizing malaria treatment supplies through government tax-waivers for said supplies, the international and national government policies do not require that care be absolutely free of cost. While the feasibility of free treatment for the entire Sierra Leonean population may be disputed due to the state of infrastructure and lack of funding for health programs, the financial barrier between the poorest members of the community and health services must be removed if we wish to increase the entire population’s access to malaria treatment.

MSF also advocates the use of rapid diagnostic tests (RDTs) for malaria, a relatively new technology that is currently being developed and improved further in the health sector. The tests allow for a high level of diagnostic certainty in the field. MSF adopted use

of the tests as a standard in 2004 after finding the old clinical diagnostic methods to be vastly inaccurate: 25% of patients diagnosed with malaria were incorrectly diagnosed, and were in fact suffering from another illness for which the malaria treatment would be of no help. The administration of these tests requires a low level of training and may be administered by community volunteers in rural areas, effectively expanding the coverage of health services for communities without adequate health centers.

Stepping-Up of ITN Use

While great improvements have been observed in the percentages of children under five and women sleeping under ITNs, it is critical that this program be expanded to cover the entire population. The use of LLINs should be advocated whenever and wherever possible. The use of ITNs remains the most efficient method of malaria prevention in Sierra Leone and its application must be further promoted if we wish to eradicate the disease.

Monitoring and Evaluation

Throughout this analysis of the state of malaria treatment in Sierra Leone, we have been hindered by a lack of adequate information on existing policies and programs and their corresponding evaluations. In order for these programs to succeed, a well-organized system of monitoring and evaluation must be implemented. This stands as a recommendation from almost every international organization and NGO and has been adopted by the government as national policy. However, the lack of available data suggests that there is much room for improvement in monitoring the efficiency of current programs. It would be infinitely helpful for the international healthcare com-

munity to create technical efficiency reports for various health centers such as those utilized in the Pujehun district (see above) to improve the efficiency of existing health centers. These recommendations for action in Sierra Leone and other afflicted nations will help to achieve significant milestones in the global eradication of malaria.

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RESEARCH

Oligodendrocyte Cell Death in a Mouse Model of Perinatal White Matter Injury

Abhijeet Gummadavelli, Class of 2010

Neuroscience

Ali Fatemi, M.D., Principal Investigator

INTRODUCTION

Perinatal white matter injury (PWMI), also known as periventricular leukomalacia (PVL), is the predominant form of brain injury and is a leading cause of chronic neurological disability and cerebral palsy in survivors of premature birth.¹ Cerebral palsy is one of the most common and costly neurological disabilities.² Recently Dr. Joseph Volpe from Harvard Medical School proposed the term ‘encephalopathy of prematurity’ for perinatal white matter injury which is found frequently in premature infants.³ Here, we describe the current understanding of hypoxia and ischemia in PWMI etiology, apoptotic mechanisms involved, and preliminary

results from our research, as part of the search for the future of treatments to this condition.

The involvement of white matter is thought to be the main determinant of disability in prematurely born infants due to the vulnerability of their developing oligodendrocytes.² White matter in the central nervous system (CNS) is made up of oligodendrocytes, the glial cells which form the myelin sheaths surrounding neuronal axons allowing for much faster conduction of action potentials. PWMI is predominantly present in preterm infants born at gestational ages 24-32 weeks after fertilization, a period that coincides with the presence of oligodendrocyte precursor cells (OPCs) and immature

oligodendrocytes.⁴ Thus, elucidating mechanisms of abnormal myelination and oligodendrocyte death via apoptosis and necrosis in PWMI is of significance for forming stem-cell-based therapies, understanding neuroprotective interventions, and extending the time window for treatment.⁵

The etiology of PWMI is hypothesized to include perinatal ischemia, which refers to a lack of blood flow to parts of the brain. With the addition of hypoxia, the resulting injury is termed hypoxia-ischemia encephalopathy (HIE).⁵ Initial studies have demonstrated an association between PWMI and asphyxia at birth.⁶ The cascade of molecular events following hypoxia-ischemia (HI) insult is complex and

temporally delayed.⁶ The physiological consequences of HI (loss of blood flow, decrease in O₂ and glucose concentrations; and increase in CO₂ and lactic acid concentrations) may lead to brain cell death via pathways of necrosis and apoptosis, depending on the severity of the injury.⁷ Studies have shown that severe insults increase necrosis while milder insults lead to a greater proportion of apoptosis.⁸ There exist many points along the apoptosis-necrosis spectrum, including hybrids of the two forms of cell death,⁹ such that the level of injury dictates the viability of various cells types.

MECHANISMS OF APOPTOSIS

Apoptosis has an important regulatory role in normal brain development for organized cell removal, making the newborn brain especially susceptible to injury via this form of cell death.¹⁰ Abundant expression of pro-apoptotic molecules such as caspase-3 and caspase-9 in the developing brain¹¹ and increased translocation of apoptosis inducing factor (AIF) to the nucleus¹² support the vulnerability of the developing brain to apoptosis after HI. Cells undergo apoptosis through three pathways: intrinsic and extrinsic caspase-mediated mechanisms, and a caspase-independent mechanism.

The intrinsic mechanism is dependent upon the permeability transition of the mitochondrial inner membrane (mtPT). Increased permeability, regulated by the protein known as Bax,¹³ releases pro-apoptotic factors (such as cytochrome c and AIF). This leads to caspase-9 and caspase-3 activation,¹⁴ which ultimately results in the programmed cell death processes of proteolysis and nuclear fragmentation.¹⁵ The extrinsic mechanism utilizes members of the tumor necrosis factor receptor super-family, such as the Fas death receptor.¹⁶ Presence of a Fas li-

gand leads to activation of caspase-8, then caspase-3; the intracellular pro-apoptotic signal is further amplified by activating the intrinsic pathway.¹⁷

A caspase-independent pathway for apoptosis utilizes a similar mechanism: the nuclear enzyme PARP-1 (a DNA repair molecule)¹⁸ confers translocation of AIF to the nucleus, again via loss of mitochondrial membrane integrity,¹⁸ which leads to impairment of mitochondrial function.¹⁹ This pathway is significant because of the greater preference in immature brains for AIF translocation¹² and because it shows a sexual dimorphism (male cells were more likely to undergo caspase-independent apoptosis).²⁰

DISCUSSION

Apoptosis in HI conditions confers an ability to naturally remove cells that are unable to properly function; however, it also leads to white matter injury. Studies have shown that apoptosis may occur for at least seven days following an initial HI insult.⁹ Important features during this period include pathways that lead to apoptosis, the vulnerability of OPCs and immature oligodendrocytes to death, and the gender differences in apoptosis that correlate to cellular and clinical data.

Three significant pathways toward apoptosis following HI include excitotoxicity, inflammation, and oxidative stress.⁵ Excitotoxicity refers to cell death following excess glutamate (an excitatory neurotransmitter) surrounding a cell due to extreme influx of sodium and calcium cations. Hypoxia and ischemia have been shown to impair synaptic glutamate removal^{21,22} and to reverse glutamate transport,²³ leading to the buildup of glutamate at synapses. Neurotoxicity with excess glutamate relies on NMDA (N-methyl-D-aspartate) and AMPA (alpha-amino-3-hydroxy-5-methyl-4-isoxazolepro-

pionic acid) receptors. In the immature brain, both glutamate receptor types open more easily,^{24,25} putting young cells at a higher risk for pro-apoptotic pathways⁵ and disrupted migration.²⁶

Following HI insult, inflammation is known to occur; elevated levels of inflammatory cytokines (IL-6 and IL-8) are correlated with cerebral palsy²⁷ and poor neural development.²⁸ From 8 to 72 hours after HI injury, activation of microglia (the resident immune cells of the CNS) is found around the site of lesion.²⁹ Consequently, it has been suggested that microglia engulf cells in the CNS destined for apoptosis as well as target and kill other cells.³⁰ Hypoxia ischemia also results in oxidative stress.³¹ Various pathways involving hydrogen peroxide and nitric oxide^{32,33} form reactive oxygen species (ROS). The young brain, with undeveloped ROS scavenging systems,³⁴ becomes more vulnerable to ROS attack on the mitochondria, leading to

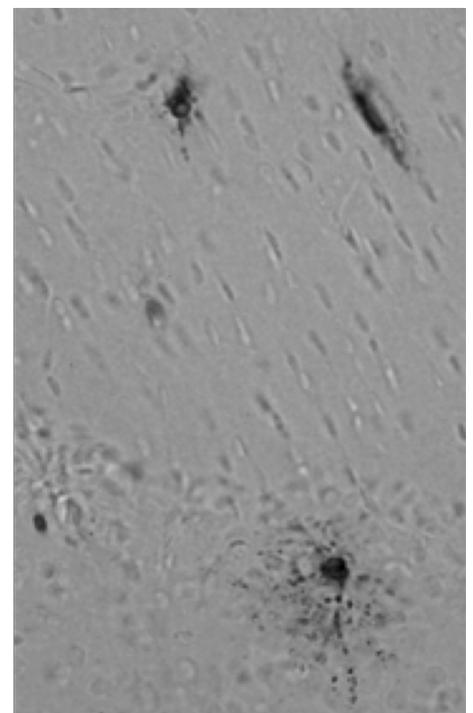


Figure 2: Caspase-3 positive cells show oligodendrocyte morphology in young animals (post-natal day 9) 24-hours following unilateral middle carotid artery ligation. This procedure is utilized to create one of the animal models of PWMI.

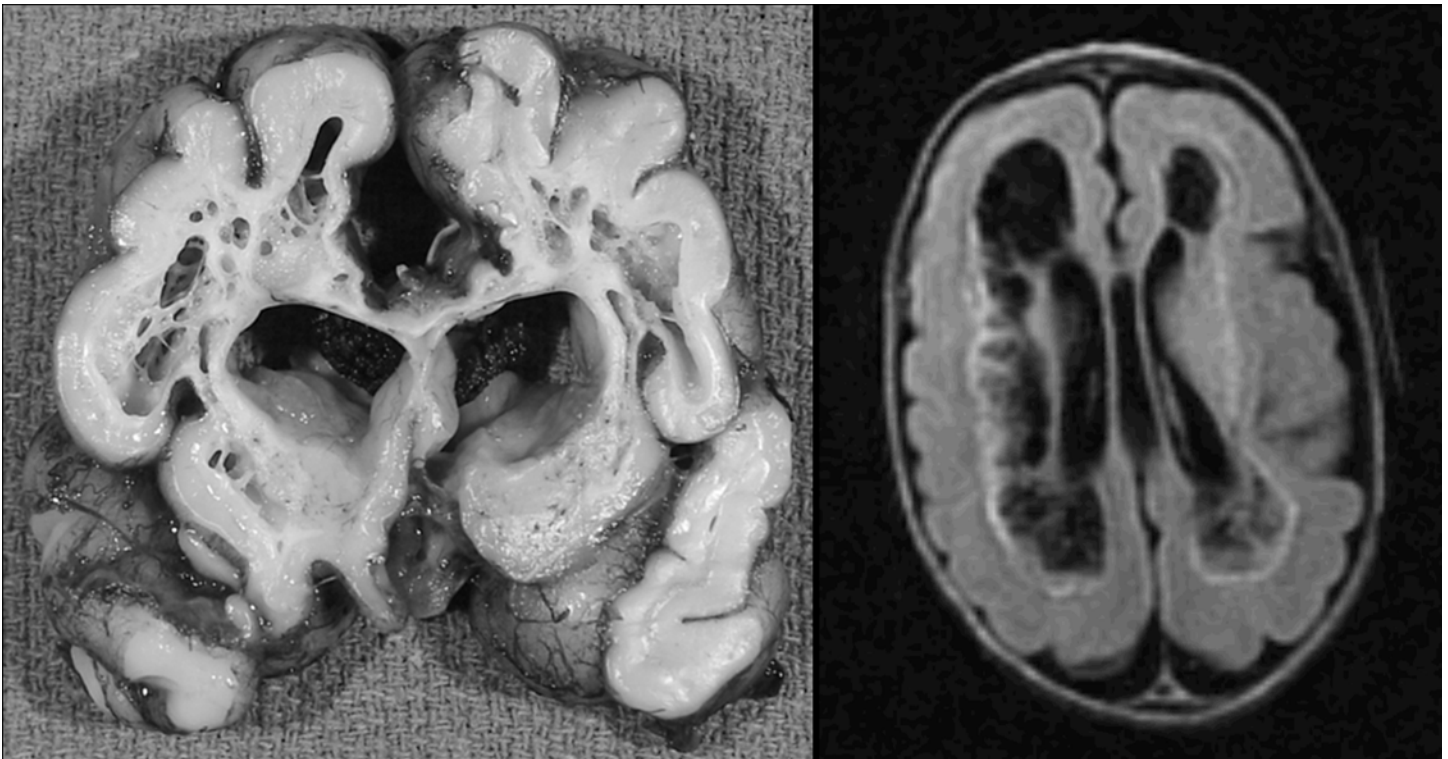


Figure 1: Cystic PWMI is seen in a human brain slice (left) and in a Fluid Attenuated Inversion Recovery (FLAIR) magnetic resonance image (right). Notable in both images are the enlarged cerebral ventricles and multi-cystic cavitation and atrophy of the white matter.

increased permeability of the mitochondrial membrane. This mtPT is the critical factor in the intrinsic apoptotic mechanism.³⁵

Our interest in white matter injury is focused on the vulnerability of OPCs and oligodendrocytes in prematurely born infants. At 24–32 weeks of gestation, studies indicate the presence of OPCs and the production and migration of immature oligodendrocytes.⁴ One vulnerability is directly on the immature cells themselves. The pro-apoptotic mechanisms discussed may affect the production and number of oligodendrocytes available for myelination. Preliminary results in our lab have suggested that ischemia in very young mice (post-natal day P4) produces more apoptosis in injured animals; interestingly, we observed apoptosis in cells of oligodendrocyte lineage (shown in Figure 2) and arrested development of OPCs. Another vulnerability may be caused by oligodendrocyte migration dysfunction. The loss of GABA cells following HI³⁶

is thought to result in migratory problems of developing cells.³⁷ Together, these adverse consequences to HI insult may cause the problems of hypomyelination seen in PWMI.

The disparity between males and females in the caspase-independent mechanism of apoptosis is interesting because such a difference is also seen in clinical data: males are suggested to have a higher risk of cerebral palsy;³⁸ imaging studies also show that males have a greater propensity for white-matter damage compared to females.³⁹ This suggests that mechanisms of apoptosis, specifically how they affect myelination, OPCs, and oligodendrocytes, may differ between the sexes, which are relevant for therapeutic developments concerning PWMI.

CONCLUSION

Despite the level of understanding of the mechanisms of PWMI and its causes in the clinical and laboratory settings much remains to be understood,

thus most therapies are in pre-clinical phases. Possible future treatments for PWMI include both endogenous and exogenous varieties. These will attempt to protect viable cells in the brain after hypoxia-ischemia injury as well as to replace damaged cells. Plausible endogenous therapies include: neuroprotective and anti-inflammatory agents (i.e. hypothermia,⁴⁰ xenon,⁴¹ caffeine,⁴² and activated protein C⁴³) trophic factors (such as erythropoietin⁴⁴), and molecular targeting to inhibit apoptosis (such as by inhibiting JNK⁴⁵ and caspase-3⁴⁶). Very recently, moderate hypothermia has been tested clinically in a study of neonatal encephalopathy with 325 patients and has shown to result in a significant reduction in white-matter lesions,⁴⁰ further supporting its therapeutic value. However, the role of hypothermia as a therapeutic approach has only been studied in term infants and no data is available on premature infants.

Studies testing exogenous strategies include cell-based therapies of precur-

sor cells, such as with oligodendrocyte precursor cells (OPCs).⁴⁷ Webber and colleagues observed a decrease in neuronal loss and an increase in NF200 (a neurofilament that is highly expressed in myelinating glia) after transplanting fluorescently labeled OPCs in eight mice in which PWMI was induced, however did not observe a change in ventricle size compared to the injured controls that did not receive OPC transplantation.⁴⁷ Using the proper developmental environment within the brain, the OPCs may replace the oligodendrocytes lost with HI injury by migrating to the injured region and remyelinating axons to reduce the effects of white-matter damage.

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Taming Tuberculosis

A Tale of Two Campaigns

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During the Nationalist Era in China, TB mortality rates had fallen from over 200 per 100,000 in the 1910s to well under 100 per 100,000 in the 1930s.¹ However, during the twelve years of war and civil unrest immediately preceding the 1949 Communist victory in Shanghai, the city's annual tuberculosis mortality rates increased, and by 1950, TB mortality rates were, again, above 200 per 100,000. This paper compares the pre- and post-1949 public health campaign materials of the Chinese Anti-Tuberculosis Association (CATA). CATA was founded in Shanghai in 1933, following the first Tuberculosis Conference of the China Medical Association.² The Shanghai Anti-Tuberculosis Association (SATA) was a CATA branch founded in 1937.

Public health materials from the CATA campaigns before and after 1949 differed in several respects. The 1930s campaign presented health as an individual's responsibility. In contrast, the 1950s campaign of the Communist government was presented in terms of mutual responsibility both of the state toward the people, and of the people in meeting state production goals.

GOVERNING BODIES AND CURBING FREE WILL

Michel Foucault's theory of "Governmentality" can be used to explain

both how governance is accomplished and how power comes to control human bodies. Foucault's theory refers not just to governance by the state, but also to governance by agents who function at the microscopic level. Because the modern state's interests tie very closely to those of the economy, the state desires a healthy workforce. In order to ensure that healthy workforce, the state gathers statistics about things such as epidemics and mortality, consumption, sexual behavior, and uses medicine as a form of social control. Power apparatuses such as police, doctors, hygiene inspectors, and heads of family operate at various levels within the state to make health a governmental end. Families were expected "to bear the moral responsibility and at least part of the economic cost" for inoculations.³ At the same time, Foucault acknowledges that societies might 'need' different types of bodies at different times and provide the appropriate military or educational discipline to produce them.

Sociologist Nan Lin provides an alternative explanation for how an individual's will might be curbed for the collective good. Whereas Foucault does not grant the individual much agency, Nan Lin sees men as self-interested actors. He chronicles how collectivities inevitably arise from the rational actions of individuals. Individuals need to be convinced that this

payoff is worth their obligation to the collective and prevented from free-riding on collective resources. To do this, the collective employs three strategies: educating actors to "*internalize* collective obligations and rewards," engaging "in mass campaigns promoting the *identification* of the actors with the attractiveness of shared resources," and developing and enforcing "rules of *forced compliance*."⁴ Lin notes that forced compliance is the quickest strategy to achieve. By contrast, internalization takes the longest and is only achieved with the help of an enforcing agent.

With respect to public health, the end result of the processes described by both Foucault and Lin is the same: improved health. Education allows for internalization of the public health message. Identification can be achieved through mass campaigns. Similarly, forced compliance is achieved by enforcing agents or members of the power apparatus. In this paper I will argue that there was a shift towards more effective campaigning from the the 1930s to 1950s because the latter addressed both the individual and collective will.

1930s CATA FLYERS: THE HIDDEN MESSAGE FOR A LITERATE PUBLIC

In May of 1938, CATA printed a

series of several red, black, and white health fliers. While the flyers themselves tell nothing of dissemination methods, we can imply that they were intended for a literate audience due to the fact that the images above the text do not provide much of a public health message on their own. Moreover, the titles of most of these flyers are riddles designed to draw the curiosity of the literate public and to entice them to read more. For instance, the flyer titled, “Hidden Disaster,” has a slightly cryptic message.⁵ The flyer’s image is a snake, mostly hidden in grass. Initially, the viewer is uncertain of the message from the image, but as one reads on, the flyer advises that while a tired spirit, loss of weight and appetite, coughing, chest pain, and blood in one’s saliva may be among the symptoms of TB, afflicted patients do not always have these symptoms. According to the flyer, only doctors can uncover the hidden danger. Readers are expected to note the symptoms of TB as well as make a link between education and treatment, which is to see a doctor when these symptoms exist. Disease treatment and prevention messages are also hidden in the text of a

flyer titled, “Love children, don’t harm them.” In the picture, a daughter looks on as her father reads the paper; in the foreground, a mother holds and kisses a baby.⁶ The flyer’s text states, “If you have contracted pulmonary tuberculosis, you must under no circumstances get too close to your children. . . . Those who truly love their children will ensure that they don’t contract TB.” The text continues, “Parents who love their children should take them for annual check-ups and get BCG inoculations.” In this respect, the prevention message might be tied to the theory of Foucault, who saw the family bearing some of the moral responsibility and economic burden for childhood health.

Indeed, by merely looking at the pictures of these flyers, the semi-literate public might be just as confused as the man seated in the foreground of another flyer (Figure 1).⁷ The shadow cast by the man is larger than the man himself. This shadow, the large question mark, and the squiggle imply something is wrong. Upon reading the flyer’s title – “Break the Taboo of Refusing to be Treated for Fear that Others Will Know About One’s Ill-

ness” – the literate public immediately learns that the stigma associated with TB is the factor paralyzing this man to inaction. The text admonishes persons who ignore illness or assuming that the illness will eventually get better rather than seeing a doctor. Emphasis is, again, on individual responsibility, but this flyer does acknowledge how societal expectations may bear upon the individual.

One of the only flyers in the campaign that illustrates a public health message within the image rather than the text features a middle-aged gentleman wearing the robe of a traditional scholar (Figure 2).⁸ As he walks between buildings of what the viewer may assume is a residential area, this man commits the “unforgivable mistake” of spitting on the ground. His sputum lands only a few feet away from where children are squatting. While the children in the foreground seem curious about his act, the more rambunctious children playing in the background are completely unaware of any danger presented by the everyday occurrence of spitting on the ground. The text warns that, despite the fact that most people do not view spitting as negative behavior, saliva may contain thousands upon thousands of tuberculosis bacteria. The flyer does not call for the creation of sanitation police, but again expects individual policing.

Was lack of governmentality and failure to present a message linking the individuals into the state’s health plan a problem for the campaign? Certainly, public health advances occurred during the Nationalist Era, particularly during the state-building era of the Nanjing decade, from 1928 to 1937.² The 1928-37 campaign, in addition to factors such as improved sanitation and health services, contributed to falling tuberculosis mortality rates during the first half of the twentieth century. We cannot ask whether this campaign



Figure 1, Left: “Break the Taboo of Refusing to be Treated for Fear that Others Will Know About One’s Illness.”

Figure 2, Right: “Unforgivable Mistakes.”
Images courtesy of the National Library of Medicine.



Figure 3, Left: "Prevention, Propaganda, and Education."

Figure 4, Right: "Maintaining Revolutionary Spirit."

Images courtesy of the National Library of Medicine.



would have achieved the same success as the Mao-Era campaigns (to which we will now turn) had war not interfered. Because war did interfere, havoc was wreaked on the Nationalist government's successful public health strides.

UNITING SATA AND THE STATE'S MESSAGES DURING THE FIRST FIVE-YEAR PLAN

Beginning in 1953, a SATA campaign was implemented in the Chinese factories. Like the flyers in the 1938 campaign, the opening poster is not designed for the forty-six percent of Shanghai's workforce that was illiterate in 1953,⁹ but nonetheless, the message of most of the thirty 15-by-20-inch posters in the series could be understood by the uneducated public. This message emphasizes the united responsibility of the government to the people in providing medical services, and of the people to the government in meeting the goals of the First Five-Year Plan. The text of the first poster is framed between the Chinese Communist crest and productive fields and factories. It reads:

Under the leadership of the Chinese Communist Party, the central government and Chairman Mao, we have started the First Five-Year Plan. In developing the production base, people's lives throughout the country have improved, and people's health has gained attention. The factory provides workers' insurance and the country provides government-funded health care. Cities and towns have strengthened the medical system to ensure people's health. In the future we will conscientiously work to finish the [five-year] plan and struggle for the socialization of industry.¹⁰

The 1930s campaign's emphasis on the individual is replaced by emphasis on the collective. This collective "we" who initiated and will strive to finish the First Five-Year Plan refers not to the socialist factory or to SATA, but to all of the Chinese people. The message on this poster does not explicitly state that the people are collectively responsible for disease control and prevention. Instead, it attributes increased health attention and care to a benevolent government (both central and local) and to the socialist factory. The poster reminds the reader that implementation of publicly funded medicine

and workers' insurance had begun in 1952. It also establishes the extent to which SATA's agenda had become tied to that of the public health bureau after the bureau assumed responsibility for SATA's budget earlier in the same year.

Within this poster series, the work of prevention is not just done in the factory. We also see power apparatuses providing tuberculosis education in the examination room, school, and home. Another poster (Figure 3) provides a visual documentation of the sites in which, according to the Shanghai Local Government, SATA did its prevention work.¹¹ The poster emphasizes that people of all ages should help the public health worker with prevention. All listen to a public health worker, who spreads the message that prevention, propaganda, and education are important for young and old alike.

The anti-spitting message had been heard during the 1930s campaign and continued to sound in public health materials through the 1950s. An anti-spitting poster from the 1953 SATA series further updates "Unforgivable Mistakes." Children squat in the foreground of an urban courtyard next to a grown man.¹² Unlike the man in traditional dress in the foreground of "Unforgivable Mistakes," this Mao-suited comrade does not spit on the ground. He is carrying a book on health, so he appears to be an enforcing agent rather than a public health offender. The sanitation message is reinforced by the red door hanging which reads "Each and every household is hygienic and spotless." The message reinforces mass identification that is multi-generational.

Perhaps due to the fact that, as Nan Lin predicts, internalization takes longer than identification or forced compliance, prevention education posters make up almost half of the 1953-54 series. A few prevention posters com-

bine internalization and identification as part of their message. For example, one poster explains how the BCG vaccine works and that it is being used in countries throughout the world.¹³ While readers internalize this knowledge, viewers also identify with the mothers from many nations who hold their babies in the poster's image. The poster appeals to the maternal protectiveness of the Chinese mother pictured in the foreground, but the message is simpler than that of the 1930s flyer, "Love children; don't harm them." The message from Foucault that the family head is a power apparatus that bears responsibility for childhood health is confirmed.

Several posters from the collection also focus on creating a sense of identification among persons who have not successfully staved off disease. These treatment posters include both articulation of common sense—"Basic TB treatment involves having rest, nutrition, sunlight and fresh air"—as well as reminders about isolating infectious diseases.¹⁴ This poster explains how isolation works: a doctor comes to the sanatorium to treat patients at designated times. The poster also offers common sense advice to patients in the sanatorium in the form of three posters on the sanatorium walls. In addition to the enforcing agent, the doctor, who monitors health, these posters remind the patient of his productive obligation.

In another poster (Figure 4), treatment widens to encompass mental health.¹⁵ The poster features a dejected patient in a Mao suit, across from a doctor with a face mask. The text of the poster reads, "Persons infected with TB must have revolutionary spirit, faith in the recovery of health, and patience." Those who comply with the doctor's rational course of actions will recover health.

From the text as well as the vision of

the worker going back to the factory, we learn that this worker is discouraged because his illness has prevented him from contributing to production. Therefore, the vision is a shared one: the patient, the doctor, and the state strive for recovery and a return to productivity. TB sufferers viewing the poster are encouraged to identify with this message partially because of the presence of a poster within the poster's vision. It reads: "Be fastidious about hygiene, reduce disease, raise the people's health level. Resist the American Imperialist Germ Warfare." Any worker viewing the poster in 1953 would know that this is a quotation of Chairman Mao. The quotation adds the presence of Mao as an enforcing agent.

Forced compliance does not end when the TB patient's disease enters the latent stage and he becomes ready to return to work. Medical and self-monitoring continue. Another poster in the series reads, "When a recovered TB patient returns to work, he must follow the doctor's orders and continue to schedule check-ups."¹⁶ According to Nan Lin, forced compliance is the quickest collective strategy to achieve. In this instance, medicine as a force of social control is achieved with the doctor as its agent of social power.

The final poster of the series shows side-by-side graphs on a display inside a factory gate. A group of workers is already gathered around the graphs, and another group of workers is just entering the factory gates. A male worker in overalls points to the graphs to indicate that he, like the other workers, is monitoring the numbers. The laborers can be proud that the health monitoring they have been encouraged to do has led to positive results. The graph on the left shows a rising rate of productivity while the one on the right shows a falling rate of loss of labor. Unlike in the work of Foucault, where

the state collects statistics in order to control bodies and workers seem less complicit in the process, in this SATA poster, workers are actively involved.

CONCLUSION: SATA, THE STATE, AND CITIZENS BEFORE AND AFTER LIBERATION

While prevention, treatment, and monitoring messages are presented during the 1930s campaign flyers, each of these tactics is presented as an individual responsibility rather than as the responsibility of all the people. The double barred red cross is used on flyers, and SATA's efforts seem largely independent of Nationalist efforts to construct a modern health service. Certainly, no links were drawn between state responsibility for a healthy workforce and meeting production goals.

By contrast, SATA's 1953-54 poster campaign presents a message of unity for semi-literate workers. During the Mao Era, public health messages were plastered on school, factory, and health clinic walls. The campaign placed primary emphasis on internalization of the prevention and early detection messages. Both doctors and workers themselves were enforcing agents in this scheme, which also emphasized mass identification with the campaign. Identification was accomplished by presenting ageless citizens wearing school and work uniforms as well as graphs showing rising production rates. In this way, the 1950s poster campaign addressed the disjuncture between individual and collective will much more effectively than had the 1930s flyer campaign.

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Golden Insights into Cancer Prevention

Controlling Differentiation of *Drosophila* Germ Line Stem Cells Using Epigenetics

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INTRODUCTION

Potential therapy for degenerative diseases such as Parkinson's, diabetes, and arthritis has become an important interest in public health research over the past few decades. As such, regenerative therapy for damaged tissues and organs, such as spinal cord injury, is a very significant area of study in medicine and public health.¹ Advances in stem cell research have provided significant insight into replenishment mechanisms, which could play a key role in providing treatment for degenerative diseases. Certain cell bodies that are short-lived such as blood and

sperm cells require constant replenishment throughout the lifespan of an organism.² Thus, the activities of adult stem cells are needed to maintain homeostasis and fertility of the human body. The depletion of adult stem cells can cause infertility and tissue dystrophy whereas over-proliferation of stem cells can lead to cancer. Therefore, the tight regulation of stem cell self-renewal, proliferation, and differentiation is essential for tissue homeostasis and regeneration. Research studies on stem cell regulation can contribute very significantly to the fields of regenerative medicine and cancer biology.

A large portion of stem cell regulation involves mechanisms in epigenetics. Epigenetics refers to inheritable changes in gene expression or function through many cell divisions that do not involve altering the primary DNA sequences.³ Epigenetic regulation is very important for normal cellular differentiation, tissue development, and organogenesis. During the normal development of cells, mechanisms that regulate the differentiation of cells from undifferentiated precursors ensure the proper development and maintenance of tissues and organs. Germ cells, for instance, must be able

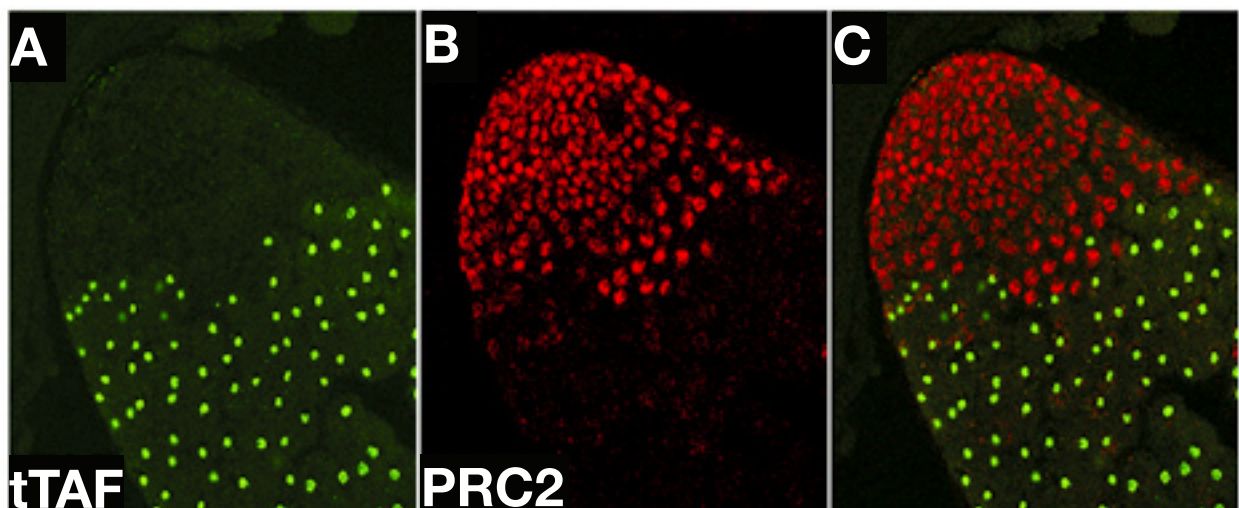


Figure 1: Image of *Drosophila* Testis Tip from Electron Microscopy. The picture (A) in green shows the signals in differentiated cells, whereas cells that express PRC2 protein in picture (B) show otherwise. PRC2 components are abruptly down-regulated in differentiating cells. (C) is the overlapped image of (A) and (B) to show down-regulated PRC2 components in respect to the location of differentiated cells.

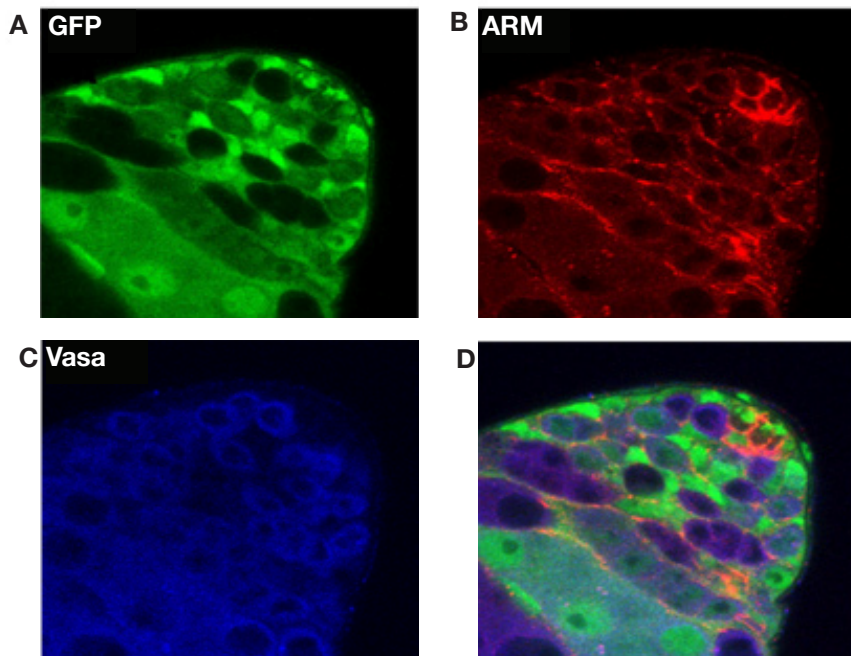


Figure 2: Images of Drosophila Testis Tip from Electron Microscopy. (A) GFP signal image shows which cells are cloned. (B) The strong red signal at the tip shows the location of the stem cell hub. (C) Blue Vasa signal shows which cells are germ cells. (D) Overlap of the images A,B, and C.

to differentiate at the right time and place in order to generate and maintain pools of functional gametes.

The mechanisms that regulate differentiation of cells can include post-translational modification of histones. Histone modification allows for changes in gene expression without altering the DNA sequence.^{4,5} For this mechanism of histone modification, the Polycomb Repression Complex 2 (PRC2) protein enzyme complex assists in generating H3k27Me3 markers, a kind of histone modification.⁵ Figure 1 shows very well how PRC2 is predominantly expressed in undifferentiated stem cells and how it is down-regulated to limit expression in differentiated cells. Unsuccessful epigenetic regulations may lead to abnormalities in development and to early steps in cancer genesis.

In our research study, we investigated the mechanisms by which PRC2 regulates *Drosophila* germ line stem cell maintenance, and the roles that specific genes, such as *E(z)* and *Su(z)12* occupy in the PRC2 complex. Exami-

nation of the mechanisms by which PRC2 regulates proliferation of the *Drosophila* germ line stem cells can reveal significant information about the regulation of the specific genes.

Two protocols, mosaic cloning and morphological comparison of *Drosophila* testes were used to observe how *E(z)* and *Su(z)12* regulate the differentiation of germ line stem cells. First, mosaic cloning of homozygous *E(z)* was performed to generate homozygous cells expressing *E(z)*. After a certain amount of time, the surviving cells were counted to see the observed changes in the survived total germ line stem cells and homozygous *E(z)* cells. Our hypothesis was that if PRC2 protein complex is truly essential for stem cell maintenance, then a significant difference would be observed in the number of cells counted after a certain amount of time. The second experimental protocol, morphological comparison of *Drosophila* testes, was conducted by observing phenotypes of *E(z)* and *Su(z)12* germ line stem cells. This experiment provided a pheno-

typical comparison between the total germ line stem cells to *E(z)* and *Su(z)12* germ line stem cells. Thus, any morphological changes in *Drosophila* testes were compared to the wild-type *Drosophila* testes.

MOSAIC CLONING OF HOMOZYGOUS *E(z)*

To induce an *E(z)* mutant clone, the following genotype flies were generated: *hsFLP⁷³¹, FRT2A/ub-GFP, FRT2A,* and *E(z)⁷³¹*. As a wild-type control, the former three kinds of flies were used. These genotype flies were transferred to a vial and incubated at 25 °C for approximately 24 hours to allow them to lay eggs. The flies were transferred to a new vial after one day to allow a new sets of eggs to be laid. On the 8th and 9th days after incubation at 25 °C, the fly pupae were heat-shocked in a 37 °C water bath for 2 hours. Afterward, the male wild-type flies and *E(z)* mutant flies were collected in order to observe the change in number of germ line stem cells in each fly group.

Regulation of PRC2 Protein Complex in Proliferation of the Germ Line Stem Cell Derivatives

Two components of PRC2, *E(z)* and *Su(z)12*, are expressed only in undifferentiated cells as shown in Figure 1. This is a crucial observation because this shows that *E(z)* and *Su(z)12* is involved in cells that have yet to be differentiated to germ cells in the *Drosophila* testes. The genomic transgenes of *E(z)-GFP* and *Su(z)12-GFP* have been given GFP expressions as a marker to be observed under the microscope from a commercial biological engineering company. To identify the morphological phenotype of more copies of PRC2 genes, testes of flies

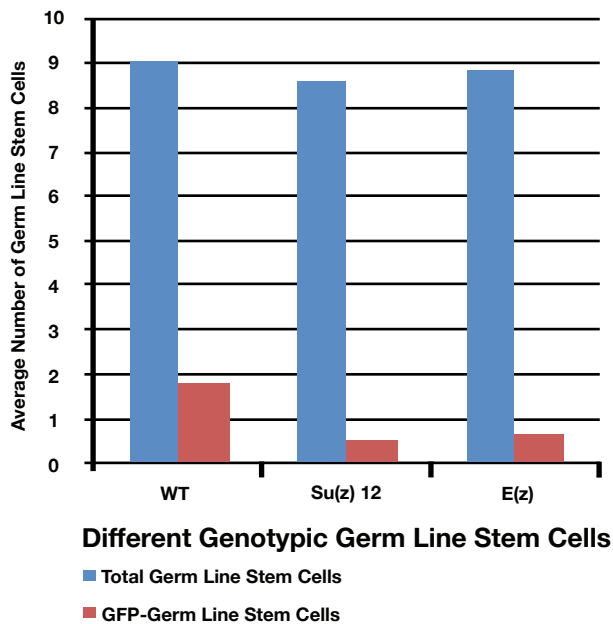


Figure 3, Above: **Average Number of GFP- Germ Line Stem Cells v. Total Germ Line Stem Cells GFP.** Graphical depiction of the data that showed decrease in germ line stem cells that are GFP- versus total germ line stem cells.

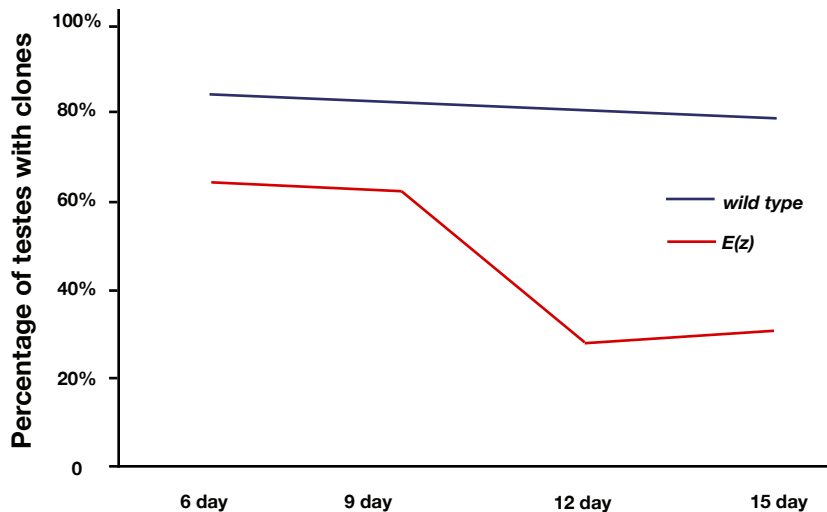


Figure 4, Above: **The Number of Testes Containing E(z) Clones is Reduced Rapidly Over Time.** Percentage of testes containing clones from total testes of WT (red line) and E(z) mutant (blue line) were calculated at several time points after clonal induction.

containing *E(z)-GFP* and *Su(z)12-GFP* transgenes were dissected and observed under a microscope.

RESULTS

In order to analyze the mechanisms that the PRC2 protein complex uses

to regulate germ line stem cell maintenance, mosaic clone analysis of homozygous *E(z)* was performed. After cloning induction, testes containing *E(z)* mutant spermatocyte clones were counted at several points in time. Figure 2 represents the graphical image of the cloned cells and compares this im-

age to the relevant locations of the hub and the germ cells. The number of testes containing *E(z)* clones decreased rapidly over the 15 day interval. Figure 3 shows the resulting data and graphically depicts the decrease in clones of *E(z)* compared to the total germ line cells.

Results from the experiment of mosaic cloning of homozygous *E(z)* illustrate that the number of testes containing *E(z)* clones was significantly reduced. This finding is very important because if *E(z)* were necessary for the maintenance of proliferation of germ line stem cells, the *E(z)* mutant germ line stem cells would not produce daughter cells resulting in the depletion of *E(z)* mutant germ cell clones. As a result, the number of testes containing spermatocyte clones would decrease compared to wild-type testes. Furthermore, this decreased number of testes shows a significant effect in the germ line stem cell maintenance by one of the transgenes in the PRC2 complex. This observational analysis, depletion of the *E(z)* mutant germ line stem cells shows that *E(z)* is essential for the germ line stem cell maintenance.

From some of *E(z)-GFP* lines, abnormal morphological phenotypes were detected with low penetrance from some of the *E(z)-GFP* lines. The morphological phenotype primarily showed no sperm and fewer differentiated cells. However, GFP expression was universally seen at the tip of *Drosophila* testes. Therefore, this result shows that the morphological phenotype may not be caused by expression of *E(z)*. The phenotype may indicate that extra copies of *E(z)* and/or stronger H3K27me3 markers are generated more, which need to be removed for differentiation. While we were unable to detect any abnormal phenotypes from the *Su(z)12-GFP* transgenic lines, some of the aforementioned

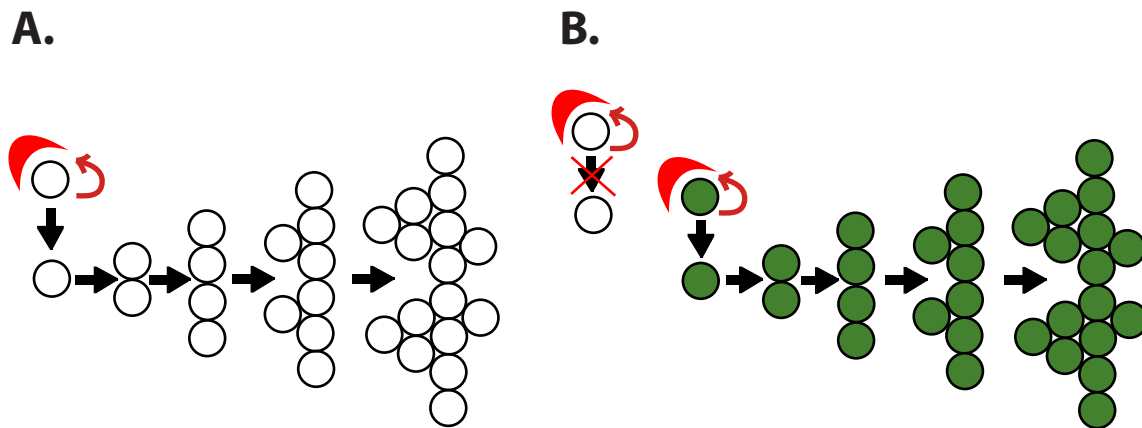


Figure 5: Graphical Depiction of the Result if PRC2 Is Required for Stem Cell Maintenance After Heat Shock. Diagram A shows the normal stem cell growth and differentiation. Diagram B shows the inhibition in stem cell maintenance and the growth of the abnormal stem cell growth that may lead to cancer.

different GFP signals reveal that the transgenes of $E(z)$ and $Su(z)I2$ are appropriate for further analysis and observation.

The ectopic expression of PRC2 in spermatocytes was performed in order to examine the mechanisms that PRC2 protein complex regulates. While I was not able to detect any abnormal phenotype from the transgenic lines of the PRC2 protein complex, some GFP signals found in the tip of the testes reveal that these transgenes of $E(z)$ and $Su(z)I2$ are appropriate for further analysis and observation. Enhanced $E(z)$ activity may block the transition from spermatogonia to spermatocytes. This further suggests that down-regulation of PRC2 activity is required to initiate differentiation in normal spermatocytes. The effect of over-expression of the PRC2 protein complex shows whether or not PRC2 activity is sufficient to block differentiation. Thus, this truly shows whether over-expression of $E(z)$ promotes prolifera-

tion and blocks differentiation.

DISCUSSION

Transgenic lines of PRC2 protein complex that are mentioned here such as $E(z)$ and $Su(z)I2$ show significant potential as new therapeutic targets for cancer prevention.

The experiments and analysis of findings that are found in this research reveal the importance of PRC2 protein complex components $E(z)$ and $Su(z)I2$ are important in regulation of germline stem cell maintenance. The results from this experiment confirm that PRC2 protein complex components $E(z)$ and $Su(z)I2$ play a key role in stem cell maintenance. Controlling and regulating stem cell is the core concept of prevention of cancer and degenerative diseases. As mentioned in the introduction, this is a very remarkable point because $E(z)$ and $Su(z)I2$ are shown to be expressed in ever-dividing cancer and degenerative cells, and proves

that if $E(z)$ and $Su(z)I2$ are not regulated and over-expressed, it can lead to cancer and many diseases. Clearly this field of research has much potential in understanding how cancer cells work and how to ultimately prevent degenerative diseases. Our research has focused on this specific regulation and control mechanisms that touches upon the characteristic that contributes the most to cancer. Using the results of the investigation on the protein complexes such as PRC2 can definitely lead to further pharmaceutical investigations to prevent cancer.

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What Would You Do with a Cow that Gives You Gold? Priceless Lessons from Argentine Children in a *Villa Miseria*

Erica Hellerstein, 2010

Writing Seminars

Buenos Aires is a vibrant city. What dynamic the city lacks in basic functionality it more than makes up for in gusto, spirit, and a passion to live life to the fullest.

But Buenos Aires is resolutely and notoriously different from the rest of Argentina. Even the country's other large cities – Cordoba, Rosario, La Plata – do not emulate the discernible and distinct European ambiance for which Buenos Aires is so illustrative.

I spent the entirety of my 2008-2009 junior year abroad in Buenos Aires, studying at the University of Buenos Aires, living in student housing, and reveling in the city's rich culture. While I did spend many an endless night shimmying to cumbia beats along the Rio de La Plata, those were not the most formative memories of my experience abroad. Without question, the most worthwhile task I undertook in my twelve months there was teaching a creative writing class to a group of 7-10 year-old Argentine children. This workshop was located at Casa del Niño, a children's shelter about thirty minutes outside of Buenos Aires, situated in Florencia Varela, one of Argentina's numerous and neglected *villa miserias*.

A *villa miseria*, literally translated to “village of misery,” is a slum situated on the outskirts of one of Argentina's larger cities. In these areas conditions are destitute; often lacking proper sanitation, electricity, and paved roads. Houses are constructed out of wood, cardboard, tin, or any other material that can be found. There are well over 640 of these *villas* in the periphery of Buenos Aires, with a sum total of over 700,000 residents. Due to a downward spiraling financial management leading to Argentina's devastating economic crisis of 2001, those inhabiting the *villas* more than doubled in number during the late 1990s, growing to well over 130,000 people as measured in 2005.¹

Florencia Varela is considered a suburb outside of Buenos Aires: not a *villa miseria*, but rather a “neighborhood,” and yet it is far from the city – not in distance, but in exposition. Driving into Florencia Varela for the first time, we saw

a young girl trudging through a half-sunken road carrying a straw basket on her head. A mangy dog yelped at her ankles. “Wow,” a fellow American volunteer remarked to me, “I feel like we're really in South America now.” She was right. “Official” *villa miseria* or not, while we were just a thirty-minute drive from Buenos Aires, we were a far cry from the Italian cafés and decadent pastry shops that comprise the noted “Paris” of South America.

Official *villa miseria* or not, while we were just a thirty-minute drive from Buenos Aires, we were a far cry from the Italian cafés and decadent pastry shops that comprise the “Paris” of South America.

La Casa del Niño hopes to provide “a safe place with open doors, welcome to everybody—but especially to the particularly needy children. Casa intends to show them how to find their paths in life despite the difficult conditions they may have been presented with.” Thus far, Casa has been successful in fulfilling its mission by supporting over 350 children daily, ranging from ages three to thirteen, and providing them with food and clothes, vaccines and medical assistance, emotional support, tutoring, showers, and washing machines.

My specific role as a volunteer at Casa was to teach a creative writing class to a group of twenty elementary school students, ranging from ages seven to ten. I proposed that each child create a story, complete with a discernable plotline and illustrations to match. Later I would edit, laminate, and bind all the children's stories into enough copies to provide for each student and for Casa. These stories would be a testament to the power of creativity and an inspiration to all of my students. Simple enough, I thought at the time. It was far easier said than done, in hindsight.

Initially, I was struck by the fact that the very elements of



Photo courtesy of Patch McCormick

vitality, ardor, and creativity that were so decisively Argentine to me were remarkably absent in the intellectual drive of my students. Every class I taught was an uphill battle. My students were resistant. They didn't want to write; they had no investment in it whatsoever. Their response and defiance were curious, and it wasn't until I honestly asked myself why they were so unwilling that I was able to remedy the problem—or attempt to, anyway.

I came to the conclusion that this communal “writer’s block” was not truly due to their intellectual distance or disinterest. Instead, it was that my fifteen students had been taught by a method of schooling that was entirely inconsistent with the concept of creative writing. Their formal education was based upon rote learning and memorization. Who was I to ask them to materialize abstract stories when the very concept of imagination had never been an element of their collective scholastic experience? I clearly needed to rework my teaching plans.

And so I did. My goal would remain the same – I still wanted my students to create short stories that I could later distribute, but my approach needed to change. The sense of unlimited possibilities that any creative endeavor fosters is inspiring. My primary objective was to impart this sensation upon my students, hoping that these simple prompts would jump-start their imaginations and aid them in finishing – or rather starting – their short stories. The prompts were as follows (in Spanish, of course):

1. One day you wake up and find you have grown wings! Where do you fly to?
2. A genie bursts out from the bottle of water you are drinking. He grants you three wishes. What are they?
3. One day as you are walking home, you stumble upon a talking dog. He says he comes from a magical land and can bring you there if you

would like. You go with the dog. What does this land look like?

4. Your sister runs into the kitchen one morning and tells you that the cow she was milking is producing gold instead of milk. She is very excited. You go with her to check, and she's right. It's gold! You milk the cow with your sister and soon you have buckets of gold! What do you do with it?

These prompts, although extremely simple, truly helped my students design and visualize their stories. I found their responses to the questions to be surprisingly moving and telling. To Question 1, the majority of the students said they would fly home to be with their parents. In response to Question 2, they said that they wished for practical things: shoes, food, new sweatshirts (no Play Stations, no computers, no ponies). For Question 3, many described the “magical land” as their own house. Finally, for Question 4, fifteen out of my twenty students said that with the gold they would buy food and clothes for the whole town. Responses tending towards materialism and excess, which I may have expected from submitting these same prompts to a group of American students of the same age, were absent. Their responses, and ensuing stories, were those of necessity, homage, and protection for their families. It wasn't that any of their answers surprised me—after all, I didn't expect from them decadent requests yearning the opulent. But I was struck nonetheless.

Working at Casa del Niño was a life-changing experience that allowed for much personal and societal introspection. Through teaching my students about creative writing, I myself learned valuable lessons about what it means to live in a *villa miseria*, and to be a marginalized indigenous minority in a predominantly European city (Buenos Aires.) Although my students did not have a lot of material “things,” their unassuming appreciation for both the tangible and intangible far exceeded mine. It is an unfortunate reality that due to the hovering presence of discrimination in Argentina, these children have been granted very few opportunities to extract themselves from their communities, go to college, and get jobs in Buenos Aires. However, to see how far these kids could go intellectually and emotionally despite all the hardships they endure is truly inspiring. Although these *villas* continue to grow every year both in number and in size, I hope to see major progress coming from the youth of Argentina.

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From Fixing Broken Lights to Delivering Babies Tanzania's Health Care System Through the Eyes of a *Mzungu*

Jinesh Shah, 2011

Biomedical Engineering

With a population of about 33 million (roughly the same as that of California¹), Tanzania is the largest country in East Africa. During the summer of 2009, I spent nine weeks in Arusha, Tanzania as part of the Engineering World Health Summer Institute. My first four weeks in the country were spent learning how to work in a developing world environment. I learned Kiswahili, took technical lessons on repairing medical equipment, and attended labs where I practiced my newly acquired skills. After that month, I spent the next five weeks working primarily as an engineer at Mt. Meru Regional Hospital. Through my interactions with doctors, nurses, other volunteers and medical interns, I gained insight into the country's healthcare system. From this vantage point, I could compare policies, physician attitudes, and the overall quality of the health care system with what I had seen in the United States and India. Initially, I expected Tanzania's health care provision to bear close resemblance to that of India, but by the end of my time there, I realized that despite their apparent similarities, the two countries have very distinct health care systems.

Tanzania's health care system is built around four large city hospitals (called Referral or Consultant Hospitals), situated in the four corners of the country: Muhimbili National Hospital in the eastern zone, Kilimanjaro Christian Medical Centre (KCMC) in the northern zone, Bugando Hospital in the western zone, and Mbeya Hospital, which serves the southern highlands. Apart from these specialty hospitals, the majority of health care service is provided by lower-tier hospitals, district hospitals, and health centers.

About 70 percent of Tanzania's population inhabits rural areas, and approximately 50 percent of the population lives below the poverty line.² As a result of this distribution, the smaller, rural medical clinics bear the majority of the health care burden.³ To help offset this phenomenon, the government has intervened and has become the primary employer of health care professionals, determining their salaries and geographic distribution. The nation aims to provide a standardized cost and equitable quality of health care. Mt. Meru

Regional Hospital, one of the largest in Arusha, is government-run. Despite this affiliation, however, the significant majority (nearly 80 percent) of the funding for hospital equipment comes from foreign donations. This includes everything from surgical tools and oxygen concentrators to stethoscopes, gauze, and sterile surgical gloves. Given scarce provisions, it was impressive to witness the staff's resourceful behavior. Because they lack proper ventilators and resuscitation equipment, anesthesiologists have to be able to switch to manual ventilation at the blink of an eye—a vital skill given the frequent local power failures. In addition, the absence of an ICU precludes any major surgery, and specialized departments like urology, cardiology, and neurology cannot exist in this setting.

Although the donation was supplied with good intentions, without the necessary supplemental counseling and programs to raise awareness, the condoms were just stacked away with the rest of the old, useless medical equipment. Another wasted donation, I mused.

Despite my status as a *mzungu*, loosely translated as "white person," it was easy for me to assimilate into the work culture at the hospital. But before I could fix any medical equipment, it was imperative that I survey the hospital's equipment inventory. I was also curious to discover how the donation process worked, and so I offered to update the hospital's inventory as a side project. Having been last updated in 2005, the inventory was outdated, and the hospital was grateful for my willingness to help update it. The store manager, Mama Joyce, allowed me to rummage through the storerooms and help catalogue incoming donations, and she granted me clearance into all of the hospital's buildings. While working on the project, I came to realize the expansive gap in communication that exists between donors and recipients. There is a huge disparity between what hospitals

need and what donors provide. Often, donors send equipment that they feel is necessary in the developing world without doing any prior research on the condition of the local infrastructure or the intricacies of the local culture.

For example, I remember opening a donation box filled with 1,000 female condoms. Not only was the hospital staff completely unaware of how to use them because there were no instructions enclosed, but the donors were apparently equally unaware of the sociopolitical status of women in Tanzania. Tanzanians, in general, dislike barrier methods of contraception, especially condoms, because they are believed to reduce sexual pleasure. Statistics show that a mere 13.3 percent of women in Tanzania use contraceptives, with condoms comprising about 8 percent of all contraceptives in use. In addition, men oppose contraceptive use because they believe that it is a warrant for women to commit adultery.⁴ Although the donation was supplied with good intentions, without the necessary supplemental counseling and programs to raise awareness, the condoms were just stacked away with the rest of the old, useless medical equipment. Another wasted donation, I mused.

It is imperative that this communication breach is mended, as it will have significant implications for the donation process and for the resource inventories of countless recipients. First, the hospital must undertake the burden of figuring out what items should be donated, and it would be held responsible for both identifying areas of weakness and for communicating these needs. Second, it would force donor organizations to become more proactive in seeking out the desired equipment, supplies, and appropriate available resources and it would render them more responsive to filling specific needs.

In a country where literacy rates have been declining, the doctor's profession is highly respected, yet feared. I never witnessed a patient seek an explanation for the treatment offered by a physician or nurse. Patients did not question their diagnoses or any of the medications prescribed for their ailments. It appears a second communication gap exists between Tanzanian doctors and their less-educated patients, which prevents them from questioning, or even understanding their treatment. Every now and then, a restless patient mistook me for a doctor in my uniform of scrubs. I would have to politely decline the requests to inspect their swollen eyes or deliver their daughters' babies or examine their children with distended bellies and relatives with pale, sweaty complexions.

One of the most rewarding moments of my time at Mt. Meru occurred when I was the individual providing a helping hand. I had been working very hard in the maternity ward repairing bili-lights, autoclaves, and high-temperature

ovens, and in the process, had the chance to get acquainted with Sister Kitumari, the doctor in charge of the ward. I had previously expressed interest in observing surgeries, but I did not really expect to receive permission. Imagine my amazement when she not only approved my presence but also invited me to help deliver a baby! Since I was not a medical student, she assigned me a simple job: I was to apply and maintain pressure on the underside of the belly while the surgeon extracted the baby. It was nerve-racking and exciting all at the same time, but under the guidance of trained doctors, a mere twenty minutes later, I had successfully helped deliver a baby girl.

Through my experiences, I learned that everything that breaks at Mt. Meru Hospital is stored away. Years of dependence on donations and aversion to incorporating new technology have bred this routine. Of all of the stored, broken equipment, my partner and I eventually managed to fix four oxygen concentrators, rebuild the surgery lights within the main operation room, build a backup power supply for the anesthesia machine, fix autoclaves, and repair numerous stethoscopes, heaters, ovens, and bili-lights. In addition, I drew up the first ever comprehensive map of the hospital grounds, illustrating the different wards and the specialized departments within each ward. This map was subsequently put up on all poster boards within the hospital and distributed freely at the reception for the convenience of the patients. We were certain that our small contributions would go a long way. In a country like Tanzania, where the vast majority of the population is uninsured, health care reforms aim to plug the holes in the system as it develops. Despite the apparent obstacles to improvement, there is hope for a promising future. With the help of foreign aid, the government is diligently working to implement healthcare reforms, with encouraging preliminary results. Incidences of HIV and malaria are declining within the country, and life expectancy is now increasing.⁵ My personal reflections on the divided health care gap in the developing world are but mere tangible objects for further study. I came only to help fix hospital equipment, but my interactions and exposures in Tanzania have inspired me to seek further involvement in global public health and to cultivate a deeper understanding of the needs of the developing world. Thinking back, I can now appreciate the old Tanzanian proverb, "Little by little, a little becomes a lot."

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FEATURES

A Glance at International Responses to Epidemics from the Other Side of the World

Stephanie Tow, 2008
Neuroscience

Cramped in a corner on Hong Kong's Mass Transit Railway (MTR) and shoved about as waves of people entered and exited the car, I began to panic. Feeling slightly claustrophobic and with barely enough room to breathe, one thought crossed my mind: What would happen if I suddenly fell ill, right here, right now? If I had a heart attack, would others notice in time? How would they get me out of this sardine can?

In May of 2008, I was afforded the opportunity to spend eleven months in Hong Kong as a Fulbright Fellow, teaching English in the classroom and, via various activities and cultural events, outside of the formal classroom setting. While traveling throughout mainland China, I quickly noticed major differences in health management in different parts of the country and often found myself analyzing and comparing the strengths and weaknesses of each region's healthcare system. Despite each area's differences, I soon realized that every region has admirable qualities in its health system, despite initial impressions.

As I hopped around different provinces of mainland China and experienced, for the first time, the diversity of cultures in each province, I was overwhelmed at times by new levels of culture shock. Friends and fellow travelers agreed that the major contributor to this was a lack of hygienic behavior. For instance, in a grocery store in Nanjing we watched uncomfortably as a couple assisted their toddler in defecating on the floor a few yards away from us. To avoid making assumptions, I considered that perhaps this couple's behavior was an exception to the norm. However, I noticed that all of

the locals simply walked past the couple and child, not giving them a second thought. I witnessed a few more instances of public defecation later on when teaching English in rural areas, specifically Luzhou in Sichuan province and Yizhou in Guangxi province. Apparently, open defecation in public spaces is not uncommon in these regions.

Unfortunately, the sense of grimness was not simply due to our imagination. Everywhere I went, the cacophony of locals hacking up balls of spit and then hurling them onto the ground made me cringe. I soon learned to watch my every step, careful to avoid globs of phlegm or other aforementioned hazards commonly left on the ground, not to mention the spray from uncovered coughs and sneezes.

Because we were housed on campus during our visits to the universities, my colleagues and I also gained insight into the living conditions of the college students we taught. Students were not provided with many options for housing. For example, the cheapest dorms at a college in Sichuan were 300 Yuan (about USD 44) per year per student and housed eight students per room. These rooms resembled small shacks, with only beds inside. The "bathroom" entailed a row of four concrete sinks sitting outside (and outdoors) of the rooms. Students had to pay extra money to obtain a pail of water (and even more money for hot water) with which to shower. Consequently, many students would shower only two or three times a week, at most; hygiene was a relatively low priority.

The college in Sichuan overbooked its incoming class and had to convert one of its classroom buildings into a dormi-

tory, housing about thirty students per room, charging 400 Yuan (about USD 58) per year per student. While this may have been an effective solution for the school to make business and to provide higher education to more students, one can only imagine what would happen if a student in these rooms suddenly came down with a contagious illness.

In many of the regions I visited in China, sanitation and hygiene were not a significant priority. For instance, bathroom facilities were often repulsive, with grime, dirt, and urine all over the floors. On the streets, live animals sat in cages next to raw meats and organs, including the brains of unrecognizable animals. Animals were often slaughtered before the eyes of customers right on the street. These stands were stationed right next to other stands that sold ready-made foods, such as buns, pastries, and soups. Locals ate their food in close proximity to livestock, increasing the risk of disease transmission from the animals.

With this image of public health in China, one may imagine my reaction when I first heard about outbreaks of H1N1 in the United States during my time there. I started to panic as I imagined the repercussions if H1N1 were to reach Asia – how could China handle this huge epidemic if it couldn't even get people to realize basic health precautions, such as covering their mouths when sneezing?

Although dubious at first, I witnessed inordinate numbers of people in Asia don facemasks as protective barriers against H1N1. To my amazement, dispensers of hand sanitizers appeared in many public areas, and people often pulled out their own personal hand sanitizers to disinfect their hands. Every time I took a flight to an Asian city, I was required to fill out a health survey, detailing my current health condition, noting whether I exhibited certain symptoms that were characteristic of H1N1, listing where

I had been during the past week, and all of the destinations I had planned for the upcoming week as well as my contact information at each one. In addition, my temperature was screened every time I got off the plane and arrived in a new city in Asia, or, as was the case at Shanghai, we stayed on the plane as health officials wearing protective suits boarded the plane and screened our temperatures using a high-tech device pointed at our foreheads. Moreover, health officials stationed at the airports closely observed passing travelers, eyes peeled for signs of H1N1. If at anytime someone was suspected of having symptoms, that individual and anyone who had been in close proximity to him or her was quarantined at a hotel in the destination city until it was determined that the individual did not have H1N1.

While going through Customs and Immigration at various airports, I noticed that there was an additional checkpoint for H1N1 symptoms. Using an American passport made traveling in Asia more difficult, especially in Macau, which forbade anyone who had been in America since the H1N1 outbreak to enter the country. Even though I departed the United States before the H1N1 epidemic began, my American passport often held up the line at immigration counters. Luckily, because I was working in Hong Kong for the year, I was considered a Hong Kong resident and my Hong Kong ID card allowed me to enter Macau.

Despite my frustrations with these travel hurdles, I was still impressed that China and most of Asia were taking H1N1 seriously. In fact, when the first case of H1N1 hit Hong Kong, all of the primary and secondary schools were shut down, and students were sent home for three days to minimize any potential spread of the flu. In contrast when my program ended and I finally flew back home in early July of 2009, I was surprised that I did not have to go through



Left: Cyclist embraces barrier precautions to prevent H1N1 transmission in Nanjing.



Right: Students jumping rope during their recess in Guangxi province.

any sort of health screening when I arrived in the US. With these two very different responses, I became confused about the seriousness of the H1N1 epidemic.

How could China handle this huge epidemic if it couldn't even get people to realize basic health precautions, such as covering their mouths when sneezing?

Perhaps the SARS epidemic of 2003 prompted the quick response to H1N1. China was criticized for its slowness in containing the disease, but it is clear that China has devised

strategies to deal with epidemics since then. While China, especially rural China, has much to improve on in terms of public health measures, perhaps the US could learn from China's methods of dealing with situations involving large masses of people. Now, after seeing China's ability to deal with epidemics, I have a greater respect for its health management system. My worries about suddenly falling ill in China and getting out of a crowded MTR car in time have decreased substantially, but I am now confronted with another speculation.

Imagine how different this situation would be on a crowded subway on this side of the world.

FEATURES

Staying Positive in an Epidemic

Meredith Mirrer, 2010
Public Health Studies

“What was her last CD4 count?” the attending physician asked. “One,” replied the registrar. My jaw dropped. “One?” I asked after a few moments, remembering that a healthy person's CD4 count averages around 1,000 cells. “Yes, but you can see she is doing much better. Yes, you're looking better today, my dear,” the physician replied. Still stunned, I pondered how the woman in front of me had walked back to her bed from the lavatory.

After leaving her bedside, the attending physician explained that the CD4 count is not necessarily definitive of an individual's physical condition. Although he explained the properties of the clinical test that make it inadequate to describe an AIDS patient's presentation, I began to learn a much broader lesson from this encounter. Severe AIDS-related illness is not a death sentence, and an extremely low CD4 count is not the end of the story.

Thanks to support from the MERCK Global Health grant and the Center for TB Research Director, Dr. Richard Chaisson, I was fortunate enough to research TB/HIV co-infection in South Africa during the summer of 2009. I worked with the Perinatal HIV Research Unit (PHRU) of Jo-

hannesburg's University of Witwatersrand on an active case finding study that recruited TB/HIV-infected index patients from hospitals and clinics and dispatched field teams to test the household contacts of these co-infected individuals.

Part of the study involved providing in-home counseling and testing for people living with TB and HIV-infected individuals. In addition, the study may determine whether



TB awareness t-shirts freely distributed throughout Klerksdorp.

active case-finding for TB and HIV is effective in detecting infection early in its progression and improves morbidity and mortality outcomes for the enrolled participants. The study's field teams, composed of a professional nurse, two voluntary counseling and testing (VCT) counselors, and a driver, visit homes of index cases in the Matlosana district surrounding Klerksdorp, a small dusty city in the Northwest Province. Nurses collect sputum from household contacts to be screened with microscopy and cultured, as well as refer children less than five years of age for tuberculin skin test, a common TB screening method, at their local clinics. Counselors offer VCT for HIV to contacts, collect blood samples for confirmatory testing and further work-up, including ELISA and CD4 counts, from individuals who test positive, and subsequently return the results to the individuals tested. After a diagnosis is made, nurses refer study participants for TB treatment and/or antiretroviral drugs (ARVs), such as isoniazid prophylaxis (INH), as appropriate. After witnessing such extreme illness in the wards, I was anxious to see how the study's field teams offered treatment and health information to individuals in their homes. Even though overwhelming numbers of patients with advanced TB and AIDS in Klerksdorp and the surrounding townships present serious illness and appear to be close to death, local health care workers do not lose hope that their patients will recover. This is a surprising but incredibly important feature of public health in this region. Facing staggering morbidity and mortality rates from TB and HIV with a positive outlook

vastly improves the grim reality of disease in the area.

Shadowing physicians at the Tshepong hospital in the Jouberton Township and working alongside nurses and counselors in the field taught me that health care workers in the region are expertly trained and highly skilled in patient communication. Of South Africa's eleven national languages, residents of the Northwest Province speak Setswana most frequently. Nonetheless, health care workers in the area accommodate patients from other provinces and countries, often moving between Setswana, Sotho, Zulu, English, and Afrikaans in a single conversation. During the household visits, the field teams impressed me tremendously when they provided informed consent to one contact in Zulu, a second in Setswana, and a third in Afrikaans, and then swiftly translated their questions to me in English. The field teams were not only fluent in many languages, but they also took the time to explain TB and HIV to household members in terms that they could understand. By informing potential study participants about the epidemics, nurses and counselors from the field teams fulfilled essential responsibilities as health educators in the community. In the future, I hope that the families that discussed TB and HIV with the field teams will be able to increase awareness about the diseases and how to access treatment among their friends and neighbors, and ultimately improve the state of public health in the region.

In addition to professional and communication skills, several incidents during my time in South Africa continue to



Cape of Good Hope from atop Cape Point.



Two South African women proudly display their TB awareness t-shirts.

remind me that the persistence of health care workers can save lives. One afternoon, the study coordinator, Modiehi Rakgokong, a South African nurse employed by PHRU, returned from the field with a discouraging account of her team's last household visit. She reported that her team found a desperately ill woman in the household with suspected TB, who required immediate medical attention. After assessing the patient, the field team decided that she might not survive another day without care, so they called for an ambulance multiple times. However, no ambulance would agree to transport the patient from her home in a relatively distant township to either of the district's hospitals, Tshepong or Klerksdorp Hospital in the CBD. The team returned frustrated, but not devastated. When asked why she was not crying or outwardly sad about the day's events, Sister Rakgokong, fondly referred to as "Sister Boss," replied that she does not cry over such things. Growing up during the period of political and social uprising against the apartheid-era education system, Rakgokong witnessed horrific violence throughout her youth, and professed that she had no tears for the current struggles she confronts in public health.

Later that evening, Rakgokong continued to communicate with the ambulance dispatchers as well as Tshepong physicians to express the urgency of the situation. The next morning, with a sigh of relief, she reported that the patient was eventually picked up and admitted to Tshepong. Two weeks later, I met this patient as the chief medical officer

discharged her from the ward with a nebulizer and a hopeful prognosis. Sister Rakgokong's dedication saved the woman's life, and her attitude reinforced the importance of a positive outlook. By maintaining relentless optimism, instead of giving up in the face of limited resources and frustrations, the study coordinator instills hope among her colleagues and encourages all of the study contributors to put forth their best efforts to benefit their patients.

Since returning to the United States, I often think about Sister Rakgokong and my experiences in the TB ward at Tshepong hospital. Meeting and collaborating with South African health care workers taught me that desperately ill patients are not hopeless cases, but rather individuals whose circumstances demand persistent care. Furthermore, I do not regard a massive epidemic as a miserable situation, but rather as an opportunity to advance the progress of public health. I am sincerely grateful to Sister Rakgokong, each of the field teams, PHRU, the Tshepong physicians and staff, Adrienne Shapiro, Dr. Richard Chaisson, the Public Health Studies Program, and all others who made my trip possible, as well as the many health care workers and individuals living with TB and HIV whom I met in South Africa, who continue to motivate me to spread their positive messages and inspire me to pursue progress in public health.

FEATURES

A Cup of Gratitude

An Innovative Campaign Against Arsenic Contamination in Bangladesh

Minhaj Chowdhury, 2011

Public Health Studies

On an auspicious Friday in mid-June, in a tiny rural village called Golaidanga in Bangladesh, folk music and flashing cameras from city media outlets filled the village's only open field. Hundreds of children, mothers, grandparents, and teenagers gathered to rejoice. Although their ages were markedly different, these people were bound together by a realization spreading throughout the village over the course of two months: The fight against arsenic contamination in groundwater may have been won. The concluding event to the Clean Water for Peace project, a public health initiative aimed at removing arsenic from groundwater, was underway, and my two-month campaign to fight arsenic was nearing an exciting conclusion.

The road to this joyous day involved some luck. My journey to Golaidanga began with a phone call to my aunt in Bangladesh. I had originally called to see how life was treating my distant family, and as the topic of my next visit to Bangladesh came up, I decided to please my family by returning to Bangladesh with a higher purpose of sorts. I wanted to leverage my family connections and resources to tackle a pressing public health problem in Bangladesh. Through my familial ties, I encountered the unfortunate tale of Golaidanga, a rural village that was fueling water conflicts due to arsenic-contaminated water. Every tubewell in the village was contaminated with dangerous amounts of arsenic. This story sparked my interest and as they say, the rest is history.

Although arsenic does not alter the smell or look of water, people who consume large amounts of arsenic contaminated water suffer from arsenicosis, a potentially fatal disease that affects hundreds of thousands of villagers every year. Residents of Golaidanga are at particular risk, as the village has inadequate access to arsenic-free water. The health hazards of arsenic poisoning are devastating; exposure can cause heart and respiratory failure, reproductive problems, and cancer. In addition, arsenic contamination also causes a great deal of social strife based on the false belief that arsenicosis is contagious. The presence of skin lesions on

the hands and feet of individuals with the disease create a divisive atmosphere, as affected children are ostracized in schools, women are unable to marry, and all affected villagers are quarantined and stigmatized by their neighbors, who fear contracting the disease themselves.

Although attempting to mitigate such a widespread, dangerous, and socially disruptive disease is not an easy task, it is not an impossible feat. With the help of the Davis Projects for Peace Program and the Johns Hopkins Institute for Global Studies Summer Research Program, I had the opportunity to confront the problem of arsenic contamination firsthand. I collaborated with Dr. David Sack from the Bloomberg School of Public Health, Dr. Charles O'Melia from the Whiting School of Engineering, and Dr. Abul Hussam from George Mason University to design an arsenic mitigation strategy centered on delivering arsenic filters to villagers. Dr. Hussam, the inventor of the world-renowned Sono Filter, a two-bucket household filter that uses readily accessible brick chips and sand to filtrate arsenic from groundwater, introduced me to his younger brother in Khushtia, Bangladesh, Dr. A.K.M. Munir. Together, we devised a simple strategy that treated the problem and laid the foundations for future eradication. First, we would distribute filters to allow villagers to remove arsenic from the local groundwater and second, and we would complement the distribution with an educational campaign to empower villagers with public health knowledge. By stressing the importance of hand sanitation and the proper use of arsenic-contaminated water in our educational campaign, the villagers would finally have the tools to mitigate arsenic contamination on their own.

Unfortunately, the realities of implementing our project were not as simple as the strategy. The critical factor that would determine the project's success was the local reception to our presence and our strategy. Through connections held by both Dr. Munir and my family, I was able to solicit the help of Habib, a local NGO worker, and Shikha,



Schoolchildren from both the primary and high schools populated the primary tent and answered questions regarding arsenic-contaminated water. The prizes were melamine cups for use in both the school and the household (although not every student had the chance to answer a question, all of them received a cup).

a 23-year old woman responsible for supplying nutrition pills to primary schoolchildren. Collaborations with Habib and Shikha facilitated the program's overwhelming success. Local villagers perceived the project as one that enabled development, rather than as an imposing intervention. By developing local partnerships before distributing filters in the field, we were able to engage the community within the first two days of our trip.

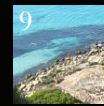
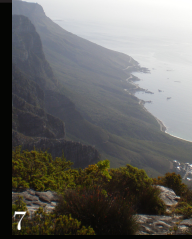
After two months, we had distributed over one hundred Sono filters, conducted a socioeconomic survey identifying the immediate needs of the community, and we had taught both schoolchildren and females of households about the importance of hand sanitation and proper techniques for handling arsenic-contaminated water. Each step of the project was discussed with the local villagers before execution. Communication was essential throughout the project, though a discussion about placemats was perhaps one of the most significant. At first, I had thought producing placemats that depicted proper uses of arsenic-contaminated water would be an excellent reinforcement of the educational campaign. By displaying pictures that showed how cooking with arsenic-contaminated water was bad and how showering with arsenic-contaminated water was okay, I envisioned a constant reminder of the "do's and don'ts" of arsenic sitting in every village household during meals. Explaining this idea to Habib and Shikha however, drew laughter and I quickly learned that villagers rarely use placemats; they simply hold their plates in their hands and sit down on the floor to eat. Instead of designing and purchasing customized arsenic education placemats, we gave each household

a plastic glass for drinking. Every time household members would use the cup, they would remember us and recall our message regarding arsenic. The idea was an instant success, and my recent conversations with Habib always include updates about how thankful the villagers are for the cup donations.

Working directly with locals not only proves how effective localized development can be, but it also speaks to the empowerment villagers feel when such a process is employed. By working with local agents, villagers learn from their peers, neighbors, and trusted members of society. Learning from locals, in our case, Habib and Shikha, creates a better sense of community as NGO staffers and foreign volunteers are usually considered outsiders. The Clean Water for Peace Project embraced the customs and collective wisdom of local villagers to accomplish its objectives.

Perhaps the most powerful outcome of the project, however, is that the filters brought people hope that a solution to arsenic contamination does indeed exist. The village elders felt that the filters were an answer to their prayers of desperation, and that the project gave hope to the children who could finally see a solution to a life-long problem. Although many tubewells in Golaidanga still stand without a Sono filter, a movement to pool resources and bring Sono filters to every tubewell has united the village. Furthermore, the movement fosters a peaceful dialogue among families who recognize a common desire to live a life free of arsenic. As a result, a source of the past generation's conflict has been transformed into a light of hope that will allow Golaidanga to overcome the challenge of arsenic contamination.

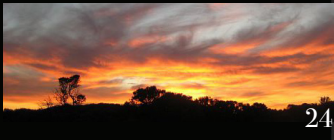
In my opinion, it is unwise to begin public health initiatives with well-crafted, exacting plans. Instead, it is better to employ a general template that is open to local inputs and opinions. Hence the notion of localized development, of working *with* the local target population, instead of *on* them, with a pre-designed strategy. Harnessing the local inputs not only ensures sustainability, but also gives us new insights into barriers to development. Golaidanga proves that it is possible to overcome obstacles through public health interventions simply by reaching out and using local people and knowledge as a guiding force for development.



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PHOTOGRAPHS COURTESY OF: Kevin Brown (8, 12, 18, 33), Halshka Graczyk (2, 4, 17, 19, 22, 23, 25, 29, 32, 36, 44), Angela Hu (1, 6, 16, 27, 28, 30, 31, 41), Li Huo (13, 14), Ramon Lee (43, 46), Meghan Marshall (9, 10, 11, 15, 20, 24, 34, 45), Sangeeta Ramani (21, 39, 40), Karthik Rao (5, 7, 37, 38), Evy Shen (3, 26, 35, 42)



Research on the Epidemiology of HIV/AIDS: A Big “leDea”

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Last year, the Department of Epidemiology held a tribute¹ to Dr. B. Frank Polk, a pioneer in HIV/AIDS research at Johns Hopkins. I didn't have the pleasure of knowing Frank, who tragically died at a young age before I joined the faculty; however, during my time here, I have been fortunate to be part of the research legacy that he initiated at the beginning of the AIDS epidemic.

In the true spirit of a “shoe-leather epidemiologist,” Frank initiated research by going into the community of the patients he was seeing in his clinic. These patients had pneumocystis pneumonia (PCP) and Kaposi's sarcoma. Frank would visit the gay bars of Washington and Baltimore late at night, ask the owners to turn up the lights, and implore those in attendance to consider enrolling in his “Study to Help the AIDS Research Effort (SHARE).” He later went on to recruit intravenous drug users in his Baltimore-based AIDS Linked to the IntraVenous Experience (ALIVE) study, and was one of the first to investigate transmission among heterosexual couples, recipients of screened blood, prison inmates, and mothers and their unborn children.

The SHARE and ALIVE studies continue to this day, with semi-annual study visits to collect a wealth of study data and specimens from a dedicated group of volunteers and researchers, a testament to their productivity and success at answering contemporaneous research questions about HIV/AIDS. However, many important questions have become far more difficult to address. The introduction of highly active antiretroviral therapy (HAART) in 1996 in the developed world, followed by expanded availability worldwide, has made a significant impact in disease progression and mortality. For instance, The longer lifespan of HIV-infected individuals receiving HAART has created the need for research into the long-term manifestations of HIV infection and clinical outcomes.

The examination of these outcomes, particularly when they are rare, requires follow-up of large numbers of HIV-

positive and HIV-negative individuals, many more persons than would be found in even the largest cohorts in the U.S. or Europe. High-quality individual-level data are needed to link disease and treatment histories with the occurrence of clinical outcomes. In contrast to the early 1980s, when Dr. Polk went out to recruit directly from the bars and the streets, we are fortunate that the current environment offers substantial advantages to address these issues. While many individuals remain unaware of their infection, a substantial number of individuals are in care and receiving treatment. High-quality data are being generated in many different research settings (like SHARE and ALIVE) that collect data as part of standardized protocols. And of great importance, data are also being generated in the clinic, and advances in information technology have made electronic capture of these data feasible. In contrast to studies like SHARE and ALIVE, these clinical cohort studies² capitalize on the data that are obtained from ongoing treatment and care for the patient to assess outcomes.

In 2004, the National Institutes of Health (NIH) brought together international HIV researchers to address the necessity and the potential for international collaborations. The consensus of the meeting was that there was indeed a need, and that it was feasible to combine data from different settings, existing cohorts, and various data sources to address important issues about HIV/AIDS. This idea of developing a set of collaborating cohorts is a recent trend in epidemiology, with similar collaborations having been set up in cancer and cardiovascular settings.³ 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.⁴

In 2005, a competitive request for applications was is-

sued, and a year later, seven regional IeDEA centers were selected for funding after peer review. In collaboration with Principal Investigator Dr. Richard Moore at the Johns Hopkins School of Medicine, our group plays a leading role as part of the North American AIDS Cohort Collaboration on Research and Design [NA-ACCORD]. The NA-ACCORD is a collaboration of single-site and multi-site cohorts that has amassed an incredibly rich dataset from over 100,000 patients across more than 50 sites throughout the United States and Canada.⁵

Does continent-wide research and our desire to 'save lives, millions at a time' require us to abandon our shoe-leather approach?

The data from the participating cohorts that have been collected and compiled demonstrate the power of such collaborations. In 2009, we used data from over 17,000 asymptomatic North American patients to evaluate mortality for those initiating or postponing HAART at different points in their disease process. Using novel methods for evaluating the impact of therapies, we showed that those who postponed antiretroviral treatment until their disease was more advanced faced a higher risk of dying than those who had initiated drug treatment at earlier timepoints.⁶

A significant finding of our work is the evidence for the virtues of starting drug treatment several years earlier than is currently recommended -- national guidelines advise starting antiretroviral therapy in asymptomatic patients when their CD4 counts dip below 350 cells/mm³, in contrast with our results.

More recently, we've evaluated the trends of multiple drug failure and predictors of subsequent mortality. HAART fortunately works well, so we needed data from over 42,000 individuals over 9 years to identify 7,000 individuals who experienced a sequence of initiating HAART, having an initial failure, switching to another regimen, and having a second virologic failure. Among this group, we observed about 1,500 deaths. Plasma HIV RNA levels, CD4 cell counts at time of treatment failure, and a history of AIDS remain independent risk factors for death, which emphasizes that these

factors remain important targets for those in need of more-aggressive therapeutic interventions.⁷

Many additional NA-ACCORD projects are underway, including evaluations of drug resistance, co-morbidities, and the impact of age on different regimen effectiveness. Further, we are collaborating with other IeDEA regions to compare the effectiveness of different HAART regimens in Sub-Saharan Africa with our experience in North America. While we must not forget the human impact of HIV/AIDS on individuals, families, and communities, the IeDEA project demonstrates how evolving technology and clinical research questions intersects with epidemiology and public health. Does continent-wide research and our desire to 'save lives, millions at a time' require us to abandon our shoe-leather approach? Frank would probably disagree, and instead would encourage us to integrate such shoe-leather activism with today's technology to push the limits of public health in the future.

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A Race To Be Cured: The Administration of Influenza Vaccines

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The 2009-2010 influenza vaccination campaign was by no means ordinary. Both the highly infectious and potentially fatal H1N1 flu and the seasonal flu came in full force, pushing the United States and the rest of the world to new limits. Immunization is considered the best means of protection against contracting these viruses. Two types of influenza vaccines were developed and made available, and there were recommendations in place from the Centers of Disease Control and Prevention (CDC) for both vaccines.

To the despair of many, there was a nationwide shortage of the H1N1 vaccine. Only 16.5 million doses of the H1N1 vaccine were available¹ by the beginning of November of 2009, a period of time popularly sought after by individuals wishing to be vaccinated. Given the scarcity of the vaccine at that time, priority was given to higher risk groups, such as pregnant women, healthcare and emergency medical services workers, and the elderly. More vaccines were expected during most of the fall months.

During fall of 2009, a team from the Johns Hopkins Bloomberg School of Public Health, led by Dr. David Bishai, studied the speed, economic aspects and safety of both existing types of vaccination. Seasonal and H1N1 injectable vaccines came in both multi-dose vials and single dose pre-filled syringes, and the goal of the study was to determine if one delivery system was significantly safer and/or worked faster than the other. Multi-dose vials usually contain about ten doses of vaccine, and each one of them must be individually drawn from the vial. The observations during a nurses' time use study were that the exercise of drawing vaccine from vials is a very time consuming process.

In contrast, pre-filled syringes contain one dose, and involve fewer steps, as only a single needle needs to be attached to the already filled syringe. Pre-filled syringes have a

detachable label for each dose which contains all of the necessary information to track the vaccine, including lot number, manufacturer, and expiration date.

Our preliminary data analyses of time use show that getting a pre-filled syringe ready for use takes about 15 seconds, whereas one dose of vaccine drawn from a multi-dose vial takes about 45 seconds. This 30-second difference between the two preparations could be crucial in many instances, such as in a pandemic situation, during which the goal is to vaccinate the largest amount of individuals in a manner most efficient. Drawing from multi-dose vials also presents the possibility of dosage error, as more or less of the recommended vaccine dose may be incorrectly drawn. Our results have also shown that there is waste of vaccine involved with using multi-dose vials. On average, over half



A team member of the influenza research unit at Johns Hopkins Bloomberg School of Public Health holds a component critical to the fight against H1N1 influenza.

of a dose was left unused in the vials. In a situation of shortage, at a national level, these numbers can add up and make a very big difference.

Despite being more costly, many parts of the world, such as Europe,² have switched to using pre-filled preparations for various vaccines. However, most doses in the United States still come from vials. A study conducted in Canada² in the year 2000 demonstrated that pre-filled syringes are faster in mass immunization clinics than multi-dose vials. The Advisory Committee on Immunization Practices (ACIP) from the CDC³ hopes to increase influenza vaccination levels to 60 percent or higher among high risk populations in future vaccination campaigns. Unfortunately, during previous years fewer than 20 percent of people in high-risk groups received the vaccine. The possibility of future pandemics, therefore, calls for a better understanding of faster and safer methods of administering vaccines. The results from our evaluation should be able to better inform decision makers and purchasers during future vaccine campaigns. Currently, scientific literature does not answer the question as to

whether or not differences in safety and efficiency between the two dispensing methods exist, and if so, what their dimensions are. Nevertheless, our preliminary results show that the pre-filled single-dose syringes, though more expensive, are faster and have safety features that multi-vial doses do not offer. The success of mass influenza vaccination relies on the availability of low-costing influenza vaccines accessible in a safe and organized manner. The research that is being done here at Johns Hopkins is about to provide many answers to these questions.

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PERSPECTIVES

The Capacity to Heal: Botswana's Efforts to Fight HIV/AIDS

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Botswana is a land-locked African nation that borders South Africa, Namibia, Angola, Zambia, and Zimbabwe. Once a British protectorate (as Bechuanaland), Botswana won its political independence in 1966. Poor land for farming seemed to doom the country to dependent economic status, but the discovery of diamonds provided the new nation with a uniquely valuable natural resource. Diamonds were the country's best friend, especially after the government negotiated an agreement with the De Beers diamond company to share the wealth. The money that poured into the government was used to build infrastructure, to pro-

vide education and law enforcement, and to take an active interest in healthcare for the entire population. Compared to other countries in Sub-Saharan Africa, Botswana was wealthy and healthy, with a relatively high life expectancy. A stable democratic government enabled Botswana to avoid some of the worst problems associated with resource-rich, underdeveloped nations.

As is often the case however, there were two sides to the coins as a result of the booming diamond industry. The men left their wives and families to work for the Debswana Mining Company Ltd and lived in settlements near their work.

Prostitutes followed and in a country in which concurrent relationships were common, sexually transmitted diseases became common at the mines and along the truck routes. When the HIV pandemic hit Botswana, the disease quickly spread through the population. Soon the country had one of the highest rates of HIV infection in the world, approaching 40% of its adult population. Without medication for pregnant women, the disease was also being transmitted to their children. Infant mortality rates increased sharply and life expectancy for adults dropped below 40 years. In effect, the disease was threatening to destroy the country.¹ The Gates and Merck Foundations both decided to create a public-private partnership to fight the disease. This was a top-down program which combined resources from Gates/Merck with Botswana's Ministry of Health and other government agencies to develop a pilot program – the African Comprehensive HIV/AIDS Partnerships (ACHAP), which emphasized prevention, increased access to healthcare, and improved handling of patients and new forms of testing and control of information. The two foundations provided \$50 million each over a five year period and Merck also gave its two antiretroviral medicines for treatment. By working in a small country with an effective government, the foundations hoped to be able to move faster and more effectively against the AIDS epidemic compared to other large national and international donors.²

The government's role was crucial. Remember that this was being done at a time when the head of state in South Africa was denying that an HIV virus caused AIDS. By contrast, the President of Botswana, Festus Mogae, declared (1999) that the pandemic was a national emergency, akin to war. AIDS-related deaths were decimating the society's educational and healthcare institutions and were threatening food production and business throughout the country. Government activities were also endangered by the high rate of infection.

There were, of course, plenty of problems to overcome. Like all modern governments, Botswana had bureaucratic institutions that were not always quick to move. There were disagreements about how and where to spend the money. The imported technicians and medical personnel often found it very difficult to work in the villages. Outside of the cities, traditional medicine was still in common use, and ACHAP had to work against the grain of local practice. Above all, the program came up against the power of stigma and denial on the part of individuals who needed treatment. Education hit a solid line of resistance in traditional gender relations.

Struggling at first, ACHAP and the government moved ahead quickly after introducing free, universal treatment us-

ing a cocktail consisting of three medicines. The foundation representatives were surprised to find that antiretroviral treatment could be so successful both inside and outside of the cities. Records had to be maintained and exchanged. All of this had to be established quickly after word that people on the edge of death were being restored to health spread throughout the country. Denial eventually gave way to a demand for treatment that initially swamped the program. Four centers grew to become eight centers, and as the program reached out into the countryside, Botswana made deep inroads into the estimated 300,000 citizens who were infected. This was followed by routine (not mandatory) testing, itself an important innovation. Soon thereafter, UNAIDS and the World Health Organization both came out in favor of routine testing along similar lines.³

Soon the country had one of the highest rates of HIV infection in the world, approaching 40% of its adult population.

Can we draw any conclusions from the Botswana experience? Yes: I believe that the country's programs exemplify one of the ways through which other African countries can build up capacity for testing, counseling, and treatment of HIV/AIDS. Public-private networks have certain intrinsic advantages over large-scale purely public efforts. The ACHAP-type of plan has the advantage of flexibility. It can change quickly and move quickly. This is important because there will be many different paths toward the common goal of dealing with the HIV/AIDS crisis. Uganda, for instance, has had great success with educational programs. Circumcision may in the future prove to be more effective than condom use, but both of these approaches depend upon the same sort of educational programs that ACHAP employed in Botswana.⁴

The Botswana efforts indicate that patience, as well as flexibility and significant resources, will be needed. Even though ACHAP was able to move down into the community level and enlist the support of dedicated, enthusiastic teachers and administrators in the educational system, it was difficult to alter deeply rooted patterns of sexual behavior and gender relations. Mining districts and communities situated along trucking routes, areas still considered essential to the Botswana economy, proved especially resistant to ACHAP. These institutions and cultures resist change and leave programs threatened by donor fatigue. This is especially the case when the world economy is weakened, as it has been lately, by a severe recession. Developed nations are all

too likely to pull back, to focus on their own populations, to trade an international outlook for a narrower national perspective. At that point, public-private programs like ACHAP play a special role in both sustaining the progress made and preventing backwards development. They can keep resources flowing and critical infrastructure functioning until the economic outlook improves and global public health can advance the priorities of the governments of the developed world.

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Meeting Information Needs for Improving Health Outcomes The Promise of Electronic Health Records

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One of the greatest public health challenges of the 21st century is to measure the efficiency of chronic diseases. Traditional measures of population health such as infant mortality, longevity, and preventable have served the US and the world well in measuring progress against public health threats in the 20th century. However, in the 21st century, chronic diseases are viewed as the major threat and are more appropriately measured by health status, also known as functional status. Health status measures can only be obtained from the patient or person by responding to standardized questions. Currently, there is no national strategy for capturing person-reported health outcomes outside of a few national surveys. As a result, we do not have critical information needed to adequately evaluate the public's health or to assess the value of medical care expenditures for chronic disease care.

My research and that of colleagues looks at ways to capture and retain person-reported health outcomes. Clinical information in medical records and in birth and death records is traditionally captured as part of each state's vital statistics. With President Obama's investment in nationwide electronic health records (EHR) implementation, a new possibility arises: to include person-reported outcomes in the EHR. Another possibility would be to enhance the capacity of administrative and billing transactions to include quality-health outcomes data that payers could use to adjust payment and to give quality reports. To provide useful information, individual and population health outcomes will need to be tracked over time.

The World Health Organization's definition of health is, "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."¹ If we

are to understand and quantify population health, measures need to encompass the positive aspects of health (positive sense of well-being) as well as more negative aspects associated with limitations in physical and mental functioning.

CHRONIC DISEASE AND HEALTH STATUS: CASE STUDY

In the mid-1990s, my colleagues and I had the opportunity to work with several major US employers and their 16 health plans to test the usefulness of the SF-36 health status outcome measure as a tool for quality of asthma care improvement among adults. The goal of the research was to understand: (1) if it is feasible to identify representative groups of adults with asthma in each health plan; (2) if a high percentage of adults with asthma will respond to a survey on asthma treatment and outcomes and agree to be followed over several years; and (3) if the information learned about treatment and outcomes will lead health plans to improve quality of asthma care and outcomes.²

Adults with Asthma: We found that it was feasible to identify adults with asthma in each of the health plans and to select a sample for study totaling 8,640 eligible adults. For billing purposes, health plans generally identify persons with asthma by those with at least two diagnoses of asthma over a two-year period. Having two diagnoses of asthma increases confidence that the person has asthma under treatment. With this criterion, 8% of the sample was judged not eligible after reporting on the survey that they did not have asthma.

If EHR data had been available at that time, would a better

sample have been drawn? EHR data would have excluded the 8% who reported that they did not have asthma if there was no diagnosis by a physician. In addition, EHR data could have identified individuals with a history of asthma and/or a current diagnosis even if the individual had not met the two-visit criterion. These would have likely been mild asthma cases not requiring regular treatment.

Asthma Treatment: Patient-reported asthma treatments were compared to accepted treatment guidelines³ that recommended all of the following:

1. Having a steroid inhaler
2. Receiving a long-acting bronchodilator medication
3. Having a peak flow meter for monitoring breathing at home
4. Reporting knowledge about (a) how to avoid asthma attacks, (b) how to adjust medications, and (c) how to manage a severe attack.

Among persons meeting criteria for severe asthma, the numbers spoke volumes on the lack of comprehensive treatment. Only 76% reported having a steroid inhaler and 57% reported having used it as recommended. 30% of severe asthmatics reported having a home peak flow meter. About half of adults with severe asthma reported being knowledgeable about how to manage their asthma. Less than one-quarter of all the asthmatics reported treatment consistent with all the guideline recommendations.

Would having EHR data have provided better treatment information? One of the strengths of medical records is the ability to document treatments ordered by the physician (e.g., medication prescribed). There are limitations with the EHR and medical records which may display some information, such as if and when the ordered treatment was actually received (e.g., prescription filled). Administrative data from the pharmacy can document that a prescription is filled but does not ensure that the medication was taken. Surveys of patient-reported treatment can document medications taken but there are biases associated with recall and self-report. Strengths and weaknesses of each information source are important to consider.

Asthma Outcomes: The study obtained multiple measures of asthma outcomes; employers were especially interested in the number of work days lost due to health problems. Among severe asthmatics, 50% reported missing work, school, or other usual activities due to their health in the previous month. SF-36 health status scores were found to be lower among asthmatics than the reference group for average Americans (mean = 50, range 0-100). Physical health summary score was 43 and mental health score was 48. Sat-

isfaction with the overall quality of asthma care was rated as excellent by only 28% of those with severe asthma. These patient-reported outcomes are not measured routinely in practice and are therefore rarely captured by the EHR or medical record.

Did Asthma Care Improve? It is generally accepted that measurement is needed to understand medical and public health problems so that solutions can be developed. In this case study, treatment measures and patient outcomes were compared to treatment guidelines in order to identify deficits in quality management. The information led individual health plans to implement a variety of educational and outreach strategies to improve the quality of asthma care. The follow-up survey at 24 months showed higher percentages of asthmatics possessing home peak flow meters and high levels of self-reported knowledge. Outcomes showed some reduction in symptom severity, fewer days with canceled activities, and modest improvement in SF-36 scores and satisfaction with the quality of care received.⁴ It is not possible to scientifically conclude that the positive actions taken by health plans were based on patient reported treatment and outcome information. There could have been other factors driving change. It is clear that without the necessary information collected, neither the quality problems nor the subsequent improvements would have been documented.

Capturing person-reported health outcomes and aggregating the data into useful clinical and policy-relevant information is essential to advancing national health.

INFORMATION TECHNOLOGY: NEW OPPORTUNITIES AND CHALLENGES

This case study was completed over a decade ago—how might it be done today or in the future to take full advantage of information technologies? Could the nationwide implementation goals for electronic health records (EHR) lead to better information on treatment and outcomes across a range of chronic medical and mental health problems? To ensure high-quality health care and to improve population health, the challenges faced in the asthma study need to be addressed: (1) the capability to identify defined populations, (2) the ability to track treatment patterns within the population over time, and (3) the capacity to systematically collect

person-reported outcomes (e.g., health status) over time. We need to develop and refine strategies to meet these challenges.

Population Denominators: Population denominators are essential for understanding population health and evaluating the distribution of disease and need for health services. A defined population may be all residents in a community, but when examining the use of health services, the defined population is more likely to be people having a common source of health insurance coverage, such as Medicare or private insurance enrollees. Using insurance coverage to define the denominator population can tell us about who utilizes health services, which providers are seen, and for what conditions. However, there is usually inadequate information to judge clinical quality of care from administrative (billing) data and little or no information on outcomes of care. Even as use of EHR's grows, administrative data are likely to remain a powerful tool for identifying populations of interest and describing their use of health services.

Tracking Treatment Over Time: Electronic health records (EHR) potentially provide the best source of information for tracking treatments ordered over time. Among those patients who see multiple physicians (primary care and specialists), EHR data will need to be linked across treatment settings to provide comprehensive information. One mechanism is the health information exchange (HIE), linking office-based and hospital EHR's. A limitation for many EHR systems is that treatment information is free text and not coded text, as is the written medical record. One strategy could be to link EHR and administrative (billing) data in which procedures, visits, and filled prescriptions are coded to facilitate analysis and tracking of treatment patterns. As discussed above, there are differences in content of EHR's and administrative data: the EHR documents the physician's order while the administrative data usually document services and treatments received. Using multiple sources, including patient surveys, might become a preferred strat-

egy to identify gaps in care and to suggest interventions to improve quality of care and outcomes.

Linking Treatment to Outcomes: Patient-reported health status outcomes have particular significance for chronic diseases, such as asthma, because they quantify the impact of the chronic disease on the person's physical, mental and social functioning. However, EHR's are not currently designed to capture and utilize patient-reported health information. Current research at Johns Hopkins by Drs. Albert Wu and Claire Snyder is testing methods for collecting patient-reported outcomes and linking them with the EHR. The investigators hypothesize that it is just as important for physicians to have information reported by patients on how they are feeling and functioning as it is to have information about lab values, imaging, and other clinical data. 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.

The potential for health information technologies to provide critically needed information to support the transformation of health care is clearly recognized by policy makers and the public. The challenge is to translate that golden potential into practice and to produce measurable benefits for the public's health.

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Snuffing Out Tobacco In Europe

How Anti-Tobacco Policies and Laws Can Save Lives Now and Forever

Jae Kim, Class of 2011

Public Health Studies

Tobacco claims a rich and controversial place in history. Although originally used for medicinal purposes,¹ its later man-made forms of consumption were regarded as high-class couture in the Old World and were used to finance empires.² Behind the smokescreen, it continues to provide enormous tax revenues for governments. The media and the scientific community have come a long way in extinguishing many of the misconceptions and myths surrounding tobacco's benefits, yet there is still no clean victory. Goliath is not dead. With increased support and evidence from economists³ and international organizations, however, anti-tobacco advocates have made considerable gains in convincing countries that reducing tobacco use is a global public health issue. At this critical juncture, it is important to recognize the role that policies and laws play in advancing this aspect of public health, and it is worthwhile to consider the milestones already achieved by several European countries.

What kind of damage can tobacco inflict? Worldwide, one in three people smoke tobacco.⁴ According to the WHO Report on the Global Tobacco Epidemic (2009), globally more than five million lives are prematurely lost each year due to tobacco use.⁵ If this becomes an established trend, in just ten years, 10 million people will die as a result of tobacco consumption.⁶ It is well known that the properties of tobacco can lead to death, cancer, cardiovascular disease, respiratory and lung disability, birth defects, and many other symptoms and diseases.⁷ In addition to physical harm, the economic burden caused by direct healthcare expenditures and loss of productivity is immense: an estimated annual cost of \$2.65 billion in the United Kingdom.⁸

The environment is also substantially affected by tobacco cultivation, which accounted for almost two percent of global deforestation between 1990-1995.⁹ To put this into perspective, 20 million acres of trees and woodlands are removed each year to make room for tobacco crops.⁷ Tobacco is a crop that does not feed or clothe people, and it has been argued that tobacco cultivation in the developing

world continues the vicious cycle of poverty, malnutrition, and economic exploitation. From any perspective taken, tobacco has negative effects that clearly outweigh the economic benefits.¹ Despite the numbers, the trade and use of tobacco products continues to maintain a strong hold on the world.

In Europe, many policies and laws have been implemented during the last twenty years to curtail the tobacco epidemic. The European Commission under the auspices of the Euro-



Photo courtesy of Ramon Lee

M	P	O	W	E	R
Monitor tobacco use and prevention policies	Protect people from tobacco smoke	Offer help to quit tobacco use	Warn against the dangers of tobacco	Enforce bans on tobacco advertising, promotion, and sponsorship	Raise taxes on tobacco

Figure 1: Framework Convention on Tobacco Control's MPOWER Strategy.

pean Union (EU) pushed for member states to implement and enforce national anti-tobacco laws between 1986 and 2002. The Commission was successful in passing several directives that banned television ads, capped the amount of tar in tobacco products, and set minimums for tobacco taxes.¹⁰ Its most ambitious project was to target both direct and indirect forms of advertisements. Direct advertisement included the radio, Internet, print media, cinemas, and ashtrays; indirect ads were defined as industry sponsorship of events or promotional logos on clothing.

Despite early victories, Germany opposed major directives and even annulled the first Tobacco Advertising Directive (TAD1) through the European Court of Justice, which ruled that the directive was beyond the constitutional boundaries of the European Commission's mandate. Yet in 2002, a coalition of anti-tobacco nations successfully passed the reformed Tobacco Advertising Directive (TED2). Although there are no official studies that directly correlate these landmark tobacco regulations with health benefits, the results cannot be ignored. In the United Kingdom, there has been a 30 percent reduction in tobacco consumption since 1970.¹¹ In addition, lung cancer rates in Denmark, Finland, Germany, Italy, Switzerland, and the United Kingdom peaked in the early 1980s and have since then declined.¹² Moreover, Germany is undergoing changes in its pro-tobacco stance and is expected to pass advertising directives that are in line with the EU, much to the disappointment of the tobacco industry.¹³

In the same vein as the European Commission, in 1999 the World Health Organization (WHO) negotiated its first global public health treaty, the Framework Convention on Tobacco Control (FCTC), to reduce tobacco use and trade. So far, the results have been impressive: It has been successfully ratified by 168 countries, representing over 86 percent of the world's population.¹⁴ The ambitious provisions of the FCTC include cessation programs, non-price measures, and price and tax measures to reduce demand, as well as regulations on advertisements, packaging, labeling, litigation, and trading. Even though almost 400 million people were covered for the first time by at least one measure of

the FCTC in 2008, the reality is that the present number only reaches ten percent of the world's population.¹⁵ To further advance the goal of a tobacco-less future, WHO drafted the MPOWER strategy (Figure 1), which consists of six policies in its global tobacco report which members should implement and enforce. All of these are proven by evidence to be cost-efficient, a major concern of many developing countries which are financially dependent on tobacco tax revenues. It is critical that global initiatives such as MPOWER are comprehensive and receive wide support because they encourage the research and development of reducing tobacco use among users and creating alternative solutions for economies that rely on tobacco revenues.

One of the most successful cases of nationwide anti-tobacco legislation is in Poland, a country where smoking was considered a cultural norm and once ranked as one of the highest consumers of tobacco in the world. In the mid-1970s, estimates showed that three out of four Polish men between the ages of 20 and 80 smoked every day.¹⁶ At the peak rate of consumption, the average Pole smoked 3,500 cigarettes annually.¹⁴ However, since the 1990s, two million Poles have quit as a result of a massive annual public health campaign, the Great Polish Smoke-Out, organized by the Health Promotion Foundation and modeled after the Great American Smoke-Out.¹⁴ Rarely does a single individual stand out in such a large-scale campaign, but in this case, the director of the foundation, Dr. Witold Zatonski, has been credited for the drastic turnaround in Poland. He organized the Great Polish Smoke-Out and lobbied heavily for Poland's first anti-tobacco law in 1995, which, among other provisions, prohibited sales to children under the age of 18 and limited tar and nicotine content in cigarettes.¹⁵ In rapid succession, the newly democratic system passed more anti-tobacco laws. The 1995 law opened the way for another in 1998 that made health warnings on cigarette packs in Poland occupy 30 percent of the exterior packaging – at the time, it was the most progressive labeling regulation in the world.¹⁷

Another law in 1999 made all forms of advertising and tobacco-industry-sponsored events forbidden in Poland and

also called for a special health tax on cigarettes to provide funding toward anti-tobacco programs.¹⁶ This 1999 act was amended in 2002 to ban chewing tobacco and adding other addictive substances during cigarette production, and using misleading labels such as “light” or “mild” on cigarette packs.¹⁵ Another mark of Zatonski’s influence was the complete removal of all cigarette vending machines in Poland.¹⁸ These powerful anti-tobacco policies and laws have improved health indicators on multiple public health fronts: life expectancy has increased by four years, mortality from heart-related diseases has dropped by 50 percent, and infant mortality rates have more than halved.¹⁵

To date, tobacco use is the second major killer of the world’s population. Several European countries such as France, Italy, and Poland are evidence of how public health campaigns can be extremely successful when policy makers and legislators work hand-in-hand. In light of the rapid and widespread adoption of the FCTC by the majority of the world’s nations, the changing stance of Germany, and the increasing number of anti-tobacco laws globally, it can be said that these auspicious signs are pointing the world toward a tobacco-free future. Policies and laws can positively influence people’s decisions and promote the implementation of public health initiatives. Clearly, this applies to the policy makers and leaders who have taken the lead in successfully reforming Poland. In sum, change requires action, as well as a healthy dose of good will. Zatonski once said, “I certainly do not do this because I hate tobacco. I do this because I love people.”¹⁹

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PRINCIPLES & POLICIES

The HIV and AIDS Epidemic Behind Bars Using Litigation as a Tool for Effective Policy Development

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INTRODUCTION

Nearly three decades after the outbreak of the HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immunodeficiency Syndrome) epidemic, far from enough is being done by judges to understand the underlying problems in prisons concerning HIV-related cases.¹ According to a report released by the United States Department of Justice at the end of 2006, 1.6 percent of male inmates and 2.4 percent of female inmates in state and federal prisons were known to be HIV-positive or to have confirmed AIDS.² Mandatory testing and segregation policies persist in some facilities, and as a result, there is a great deal of HIV- and AIDS-related litigation filed by prisoners and prisoners' rights advocates.³ Judges have struggled with how to best interpret the policies within the framework of the Constitution and without interfering in the governance of correctional institutions. In general, courts have left it up to the discretion of prison authorities as to whether to introduce or to continue such practices within their facilities.⁴

According to leading public health organizations, the policy of mandatory testing is unethical and ineffective, and the policy of segregation, often an outpost of mandatory testing, is dangerous and inhumane to inmates infected with HIV or AIDS.⁵ The Centers for Disease Control and Prevention (CDC) opposes both policies in favor of universal precautions and the use of educational programs.³ Public health organizations have endorsed recommendations for correctional authorities on how to best decrease the spread of the virus including the distribution of condoms and the provision of sterile injection equipment. Although it is well-known that both sexual activity and intravenous drug use occur inside prisons and jails, correctional authorities do not provide inmates with the necessary means to protect themselves against contracting the HIV infection.¹ Most correctional facilities prohibit sexual activity and drug use, which is why they remain reluctant to adopt such harm re-

ducing strategies.³

The HIV/AIDS epidemic behind bars is a critical challenge to both the correctional health system and the public health community. More than 90 percent of inmates will eventually be released back into the community, and one study found that inmates with HIV had unprotected sexual intercourse within an average of six days of their release date.⁴ If a state fails to implement recommendations advocated by organizations whose main interest is to protect the health of the general public, then courts should intervene.

MANDATORY TESTING IN CORRECTIONAL INSTITUTIONS

According to the World Health Organization (WHO), the use of mandatory testing is unethical and ineffective.⁶ Similarly, in a recent report, *HIV Testing Implementation Guidance for Correctional Settings*, the CDC asserted that prison authorities have a duty to protect the confidentiality of inmates' medical information. The CDC did acknowledge that protecting the right to privacy can be challenging in correctional facilities due to tension that exists between maintaining that as well as optimal security and safety. In concern for the safety of inmates who test HIV-positive, however, maintaining the privacy of their medical condition is all the more important.⁷ Even with some of the leading public health organizations' stance against the use of mandatory testing in correctional settings, courts have been lax about the policy in terms of its potential infringement upon an inmate's right to privacy.⁶

Proponents argue that identifying all inmates who are HIV-positive will prevent the spread of the infection within the correctional system and will provide those infected with adequate medical treatment and support.⁸ The case *Turner v. Safley* set the precedent, which grants correctional personnel the right to implement policies that have a rational relationship to fulfilling the duties inherent in maintaining

correctional institutions. Thus, when a prison regulation impinges on inmates' constitutional rights, "the regulation is valid if it is reasonably related to legitimate penological interests."³

The law becomes an instrument of public health when it is "used to establish norms for healthy behavior and to help create the social conditions in which people can be healthy."

Opponents have contended that the use of mandatory testing is unethical. In concern for maintaining security and safety within a correctional facility, prison officials may be unable to maintain inmates' medical information confidentiality. A positive HIV result can lead to intimidation and stigmatization from other inmates and guards concerned about the spread of the infection within their facilities. Unrealistic fears about ways that the virus can be spread have led non-HIV-infected inmates to bring claims of cruel and unusual punishment under the Eighth Amendment for inadequate medical treatment due to a correctional administration's failure to implement mandatory testing as a precautionary measure.⁹ While courts have refused to stop correctional institutions from practicing mandatory testing, they have also rejected suits by inmates who have sought to introduce the practice for the purpose of identifying, then segregating, the HIV- and AIDS-infected inmate population.¹⁰

Over the years, scientific research continues to unveil the facts about how the virus is transmitted and what treatments are available for individuals infected with HIV or AIDS. As an entity that oversees the governance of correctional institutions, the State should support policies beneficial to the health of the public inside and outside of correctional settings. But some of the policies recommended by public health organizations, in preventing the spread of the HIV infection, contradict the policies set forth by the State in how it maintains its correctional system.

THE PRACTICE OF SEGREGATION WITHIN CORRECTIONAL INSTITUTIONS

Some of the justifications that have been offered to support the practice of segregation include: (1) it protects infected inmates from other diseases that with which they would come in contact if allowed to be "mainstreamed" within the general population, (2) it allows for better management of the infected inmates in terms of specialized medical care,

and (3) it is necessary in order to prevent the spread of the HIV infection. Opponents of segregation have insisted that it "may provide a false sense of security for inmates in the general population" by insinuating that everyone who is not segregated is safe. Due to testing errors, the incubation period of the virus, and difficulties encountered in pinpointing the time of the infection, it is impossible to identify and segregate every infected inmate from the general population.⁸

In 1988, the United States District Court for the Northern District of New York considered, in the case *Doe v. Coughlin*, the question of whether the privacy rights of inmates who were HIV-positive and were involuntarily segregated to a dormitory in a New York correctional facility were violated. The Court found that the inmates had two distinct and constitutionally protected privacy interests: keeping their diagnoses private from others and deciding when and under what circumstances to have that information revealed.¹⁰ The Court asserted that involuntarily segregating inmates who have HIV or AIDS is severely detrimental to the inmate's ability to protect and shape his identity without the stigma of his medical status.

USING LITIGATION AS A TOOL FOR ENDORSING THE DEVELOPMENT OF EFFECTIVE PUBLIC HEALTH POLICY

In March 1991, the National Commission on Acquired Immune Deficiency Syndrome called attention to the predicament in the nation's correctional facilities by stating "that no other institution in this society has a higher concentration of people at substantial risk for HIV infection."⁸ Activities such as rape and unsafe drug use contribute a significant risk to non-HIV inmates. Thus, preventive measures can be implemented by correctional authorities to protect the non-HIV-infected inmates who choose to engage in behaviors such as consensual intercourse and intravenous drug use. But many remain reluctant to allow the presence of condoms and sterile injection equipment within their facilities.

Case Analysis: Policies of Maryland's Division of Corrections

Within seven days of intake, all newly admitted inmates entering the Maryland Department of Public Safety and Correctional Services (DPSCS) receive a physical examination. All inmates within the Maryland DPSCS are also offered HIV testing 90 days prior to their planned release date from the system.¹² The DPSCS is required to implement proac-

tive discharge planning for HIV-positive and AIDS-afflicted inmates that enables the released inmate to receive continuation of appropriate treatment and other HIV/AIDS-related services upon release.¹² Since the transition for inmates from confinement to the outside community is often chaotic and difficult, healthcare concerns often assume a lower priority compared to immediate necessities such as housing, food, and employment.⁷ According to the CDC, it is important to link HIV/AIDS-infected inmates to medical services in the community when they are released from the correctional system. By having a stated policy aimed at assuring the continuation of medication for inmates affected by HIV/AIDS upon release, Maryland is in line with the recommendation advocated by public health organizations. However, when it comes to the distribution of condoms and access to sterile injection equipment in order to reduce the spread of the virus, Maryland's Division of Corrections has steered away from this direction.

The Correctional HIV Consortium estimates the cost of caring for an HIV-positive inmate at \$80,396 per year and caring for an inmate diagnosed with AIDS at \$105,963 per year.

According to the Maryland DPSCS, inmates within the system are prohibited in any manner from committing, performing, or engaging in activities such as nonconsensual or consensual sex acts. The Division of Corrections also prohibits inmates from tattooing or being tattooed and from using illegal drugs during their period of incarceration.¹³ Given that all of these risky activities do occur behind bars, they pose a significant risk to the non-HIV-infected inmates.¹⁴

In the city jail of Washington DC condoms are provided free of charge through public health and AIDS service organizations. According to collected data from surveys, 55 percent of inmates and 64 percent of correctional officers at the Washington DC jail support the availability of condoms in the jail. Critics cite that the distribution of condoms would be equivalent to encouraging illegal sexual activity, but most of the inmates at the Washington DC jail did not believe that condom availability led to an increase in sexual activity. The majority of inmates, correctional officers, and leading public health organizations support the availability of condoms to prevent the spread of the HIV infection.²²

With regards to the occurrence of substance use within prisons and jails, harm reduction measures are perceived by correctional systems as a threat to security regulations and traditional abstinence-oriented drug policies. No correctional facilities, in the US provide sterile injection equip-

ment to inmates.⁴ However, harm reduction programs relative to intravenous drug use exist in more than 50 prison systems in eight European countries. Evaluation of these programs has found that the introduction of sterile injection equipment (1) did not lead to an increase in drug use, 2. did lead to a dramatic decrease in needle sharing, 3. did not cause new reported cases of HIV infection, and 4. did not increase the use of needles as weapons.²³ In an aim to reduce the spread of HIV infection inside prisons and jails, the use of litigation appears to be a viable option in promoting the introduction of harm reduction strategies endorsed by public health organizations.

CONCLUSION

Inmates in correctional settings are susceptible to the HIV infection as a result of known participation in certain high-risk behaviors, such as sexual activity and intravenous drug use. The Correctional HIV Consortium estimates the cost of caring for an HIV-positive inmate at \$80,396 per year and caring for an inmate diagnosed with AIDS at \$105,963 per year.¹⁵ Because taking care of the infected population poses a financial hardship for the budgets of correctional facilities many prison authorities initially implemented simplistic solutions in trying to prevent the spread of the virus.¹⁶ Since the standard to meet and to prove "deliberate indifference" under an Eighth Amendment claim is very high, courts have dictated their opinions with a hands-off policy. Correctional facilities provide a unique opportunity for HIV diagnosis, treatment, prevention, and harm reduction education. Under the Turner test, the policies of mandatory testing and segregation should no longer be considered legitimate methods in controlling the spread of the virus.⁶ Because most prison authorities prohibit inmates from committing, performing, or engaging in high-risk activities, harm reduction devices are considered contraband.¹⁷ The use of litigation can serve as an endorsement of policies aimed at protecting the health of individuals inside and outside of correctional settings.¹¹ By using public health experts to understand the HIV and AIDS epidemic behind bars, the occurrence of high-risk activities in correctional facilities, and the need for harm reduction strategies, judges should interpret the Eighth Amendment as requiring the distribution of condoms and the access to sterile injection equipment. To deny inmates access to these simple and potentially life-saving devices, correctional authorities are acting with deliberate indifference to the inmates' safety and health in accordance with the modern interpretation of the Eighth Amendment.¹⁷

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PRINCIPLES & POLICIES

Abortion in Chile

Heritage Confronts Conservative Cosmopolitan Culture

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While living in Chile for five months, I was surprised to find one of the nation's greatest contradictions in women's health. In 1989, the last year of dictatorship, legislators moved to outlaw abortions, even those performed in order to save mothers' lives. When the law was partially repealed in 1991, abortion was legalized only in highly restricted cases and only after the 22nd week of pregnancy. If discovered to have undergone an abortion, a woman faced up to five years in prison. The medical professionals (doctors, nurses, or midwives) who assisted in the illegal abortion faced a minimum of ten years in prison.¹

Despite external influences, Chile's Catholic heritage defines life for much of the nation, deeply affecting national abortion laws and nomenclature. In the medical sphere, professionals do not perform abortions on pregnant patients. Rather, they perform "induced labor" or "interruptions of pregnancy" at or above 22 weeks. In addition, professionals who cannot definitively prove the absolute necessity of the procedure face prosecution. The fear of losing medical licenses prompts some doctors to wait until mothers de-

velop severe health complications. This occurred in 2003 when a woman with a molar pregnancy (a rare condition in which a growth forms inside the uterus at the beginning of a pregnancy) requested an "interruption of pregnancy" and her doctor denied her request despite public support for the procedure.² Clearly, these religiously motivated fears put pregnant women at risk for fatal consequences. Even in extreme cases, victims of rape or incest could not legally terminate their pregnancies. Most notably, in 2005 a nine-year-old who was raped by her stepfather was denied an abortion and was forced to carry the child to term.²

Chile, as I discovered, is a divided country. Chileans cannot even reach an agreement concerning the Pinochet regime's human rights violations. When I arrived, I assumed that the people would act and speak unequivocally against the notorious Pinochet regime. I could not imagine that any Chilean would support the torture and murder that occurred throughout the 1970s and 1980s. To my amazement, however, half of the population still supports the dictator. At

a weekend almuerzo (luncheon), my host grandmother proudly showed me a Pinochet iron-on decal; on another occasion, two Chilean friends started a heated argument at a bar during which one of them said that he supported the dictator's policies. I quickly learned that political controversies play an enormous role in everyday Chilean life.

Abortion, however, remains a taboo subject matter in Chile. Wives do not discuss it with their husbands, and lawmakers in Valparaiso feel more confident that they will be reelected by their constituents if they resist changes to current abortion policies. In her 2005 campaign, President Bachelet listed abortion on her political agenda, but to date no concrete changes have been realized and, unlike in the United States, there is no strong public movement or lobbyists to promote the cause. As a result, Chilean women do not have many choices to deal with unwanted, unplanned, or otherwise unsafe pregnancies. The government takes no official stance as to whether or not "la píldora del día después" emergency contraception referred to as the "morning-after pill," is, in fact, abortion. Each district judge, therefore, decides for his or her own respective realm, creating further inconsistencies throughout the country's judicial system. Women in the lower socioeconomic spheres in some areas have learned to evade current restrictions.

Aside from the possible dangerous effects of using medication in an unsupervised and unorthodox manner, I was shocked that a democratic country in the twenty-first century would ignore a topic as important as abortion. But I had to learn how to put the laws that made no sense to me, an American, into Chile's social context. Catholicism permeates Chilean society at every socioeconomic level. The male-

dominated society and machismo attitude towards women, although changing in the middle class, still reigns in the lower classes, where constituents lack a champion to fight for their rights in the legislature. Social inequity abounds in South American society, and although Chile has achieved higher levels of development than some of her neighboring countries, Chileans still have yet to address the ethical issues that come with their technological advances.

Initially, Chilean's seeming indifference towards abortion mortified me. However, now that I understand the social reasons as to why change has been hard to achieve, I am excited to follow the developments in my adopted country. I am pleased to report that the ingredients for change are all present: a female president-elect, a generation born after the horror of the dictator's regime gaining power, and bright economic prospects despite a deep recession. As such, I predict a prosperous future for Chile, as it learns to marry a strong Catholic heritage to the growing movement for women's rights.

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Can you
see
yourself
in **EP?**

Photo courtesy of Luis Oros

Moving Forward Smoke-Free Environments in Latin-America

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UNCOVERING AN EPIDEMIC - SECONDHAND TOBACCO SMOKE IN LATIN AMERICA

By the end of the 20th century, secondhand tobacco smoke was well known for containing multiple toxicants and carcinogens. However, in Latin America, little was known about the extent of exposure to secondhand smoke in public places. Although some legislation regarding secondhand tobacco smoke was in place (which varied across countries), the level of compliance to the legislation ranged from low to zero.

In this context, mobilizing action in support of smoke-free communities was difficult due to a lack of objective data and public awareness of secondhand smoke. Yet, upon my arrival to the Johns Hopkins Bloomberg School of Public Health in 2001, I was presented with the opportunity to collect useful data when I coordinated a collaborative effort between the Institute for Global Tobacco Control at Johns Hopkins University, the Pan American Health Organization (my previous workplace) and multiple organizations in Latin America.

Our priority was to objectively assess levels of secondhand smoke in a variety of indoor public places across the region. We thought that quantifying secondhand smoke levels in critical locations would allow us to learn about the extent of secondhand smoke exposure in the early 2000's in Latin America. We wanted to use the secondhand smoke data to compare levels across different locations, evaluate the current legislations, plan better interventions, and track progress in reducing secondhand smoke exposure over time. To achieve these goals, between 2002 and 2004, we measured indoor air nicotine concentrations in schools, hospitals, government buildings, airports, and restaurants and bars in Argentina, Brazil, Chile, Costa Rica, Guatemala, Honduras,

Mexico, Panama, Paraguay, Peru and Uruguay.¹⁻⁵

We selected nicotine as a marker of secondhand tobacco smoke because nicotine in indoor environments is indicative of smoke presence. The laboratory technique used to measure nicotine accurately and reliably was developed in 1987 at the University of California, Berkeley.⁶ The accuracy of the method is unquestionable: air nicotine concentrations correlate well with the number of cigarettes smoked.

For our study, we assembled filter-badges in the Exposure Assessment Laboratory at the Johns Hopkins Institute for Global Tobacco Control. Once in the country, trained investigators placed the small, unnoticed filter-badges in a variety of locations selected following the same protocol in all countries. The filter-badges passively filtered the air for a period of seven to fourteen days, trapping the nicotine released during that time in each location. At the end of the sampling period, the filter-badges were sent back to the Johns Hopkins University laboratory. There, nicotine was extracted to provide a time-weighted average estimate of air nicotine concentrations ($\mu\text{g}/\text{m}^3$) in each location. Using this relatively simple method, we monitored more than 1,100 indoor public places (about 100 locations per country) across major cities in Latin America.

The 2006 report of the Surgeon General⁷ clearly indicated that there is no safe level of exposure to secondhand smoke. Therefore, nicotine levels in indoor environments where people work and spend time should be zero. In our study, however, airborne nicotine was detected in more than 90% of locations surveyed, including schools and hospitals. Important differences were found across locations and countries (Figure 1). Despite legislations banning smoking in educational and health care facilities, Argentina and Uruguay had very high nicotine concentrations in hospitals, schools, and government buildings. Our data re-

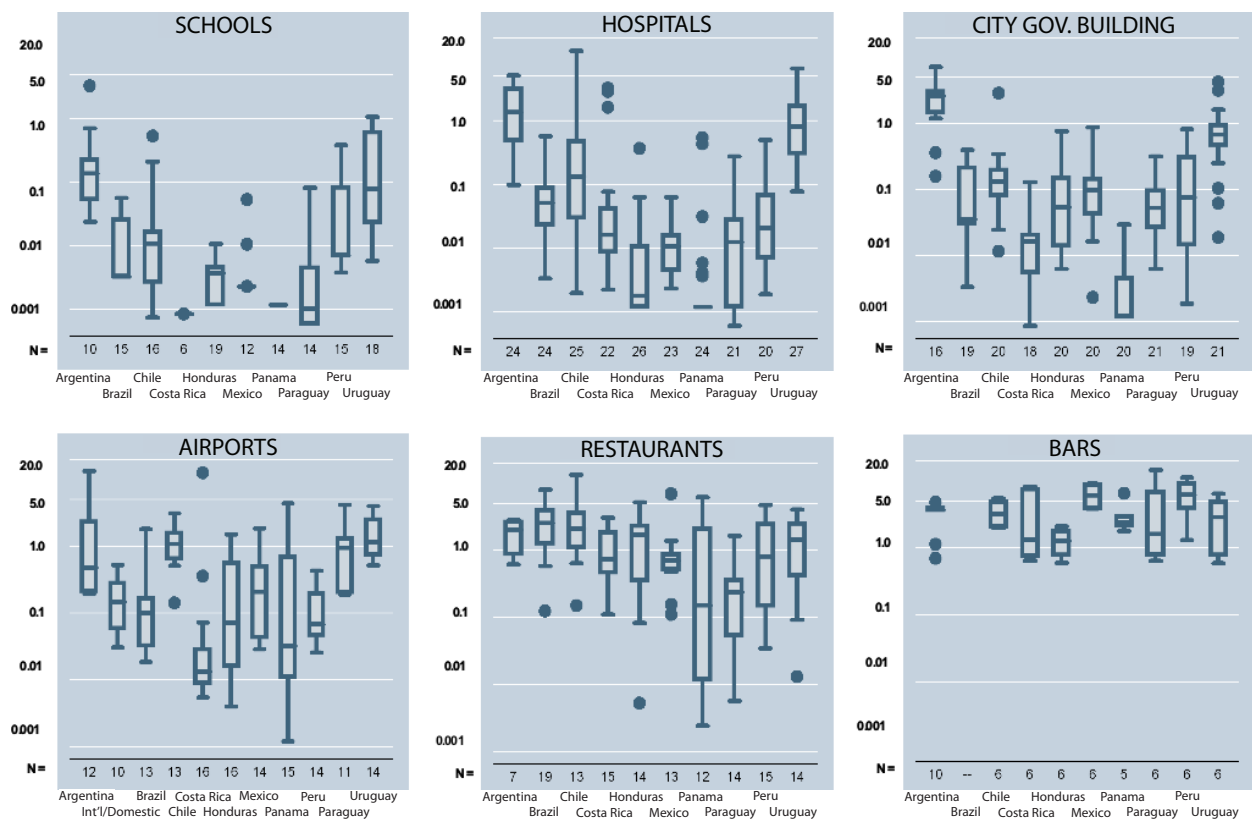


Figure 1: Air nicotine concentrations ($\mu\text{g}/\text{m}^3$) in public places in Latin America, 2002-2004

vealed incomplete compliance and the need to strengthen enforcement of secondhand smoke regulations in these key locations.

In bars and restaurants, where employees are exposed to smoking patrons for an extended period of time, concentrations of air nicotine were strikingly high in all countries (Figure 1). Air nicotine concentrations were high even in non-smoking areas, showing once again that simply separating smokers and nonsmokers in the same airspace does not protect nonsmokers from inhaling tobacco smoke. The high concentrations of nicotine measured in restaurants and bars were of major concern for the health of employees working in those environments. Our study showed that comprehensive smoke-free legislation was urgently needed in Latin America.

USING NICOTINE DATA IN SUPPORT OF SMOKE-FREE ENVIRONMENTS

Our findings had immediate implications for public health professionals and for the government entities responsible for protecting the public. The good news was that this source of indoor pollution could be easily eliminated by enforcing complete smoking bans in all workplaces. To make those changes, effective dissemination of the study find-

ings was needed. The initial peer-review publication of the study¹ received substantial media attention in Latin America. More important, our partner organizations were actively engaged in tobacco control activities in their countries and used the data in support of the changes in legislation and enforcement of those laws related to secondhand smoke. To help them with dissemination, we prepared specific country reports that included summary tables, figures, and conclusions highlighting the key points for each country. The reports also provided tobacco legislation details at the country level and summarized the international evidence for smoke-free environments. They had to be easily understood in order to reach wide target audiences: policy makers, medical and public health providers, media and the public at large.

INITIAL SUCCESSES

The air nicotine data and the multi-country approach proved to be powerful tools in support of smoke-free environments. In most countries, the results were presented to congressional or parliamentary committees dealing with smoking legislations. In 2004, the government of Uruguay cited the study in a decree enacted to make all health care facilities smoke-free. Two years later, in 2006, Uruguay was the first country in the Americas and the first low-middle in-

come country in the world to enact a comprehensive national smoke-free legislation to protect all people, including bar and restaurant employees, from exposure to secondhand smoke in indoor public places. In 2008, the secondhand smoke data also encouraged Panama and Guatemala to enact comprehensive smoke-free legislations. In other countries, legislation remains incomplete at the national level. Many cities, however, are taking the lead and passing comprehensive smoke-free legislation in their jurisdictions.

In our study, however, airborne nicotine was detected in more than 90% of locations surveyed.

NEXT STEPS

The fact that three countries have passed comprehensive smoke-free legislation since we conducted the study in 2002-2004 is remarkable. Now, it is time to track the progress in the reduction of secondhand smoke exposure in those countries. We are revisiting the 2002-2004 study locations in Uruguay and Guatemala to re-measure air nicotine concentrations. Our questions are the following: Has exposure to secondhand smoke changed? Are levels of enforcement similar across different institutions? Are additional enforcement efforts needed? As a preliminary report, we can capture extraordinary decreases in secondhand smoke exposure levels in Uruguay and Guatemala. By objectively documenting the important changes in secondhand smoke exposure in countries with comprehensive smoke-free legislations, our hope is to encourage other countries in Latin America and other regions of the world to take the necessary steps to eliminate tobacco smoke from indoor public places and workplaces.

ACKNOWLEDGMENTS

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Forgotten Heroes

The Need for Improved Mental Health Care for Returning U.S. Soldiers

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Etched on one of the greatest, American icons are the resounding words of Emma Lazarus: “Give me your tired, your poor, your huddled masses yearning to breathe free.” These words found on the pedestal of the Statue of Liberty have become an integral part of the ideology upon which this virtuous nation was built. America was founded on the principle of promising those seeking refuge a safe asylum, and an important part of providing this safety is proper healthcare for both body and mind.

In a previously published edition of *Epidemic Proportions*, the mental health of refugees was addressed. “Cultural Incongruence” discussed the urgent need of a revamped system of mental health screening, one that is more culturally sensitive and aligned to the needs of each ethnic group of refugees.¹ Initially, this topic may not seem like a pressing matter because it does not make the headlines of our news sources. What we are confronted with instead, are the ongoing military progressions in Iraq and Afghanistan. But, what if the headlines of tomorrow’s paper explained that our heroic soldiers are suffering from the same lack of access to mental health services as a faceless group of refugees?

The fact of the matter is that many soldiers returning from Iraq and Afghanistan are suffering from symptoms of post traumatic stress disorder (PTSD) along with other mental health symptoms. Studies have shown that almost 25 percent of soldiers in duty tested positive for anxiety, depression, and other mental health problems.² This situation has great similarity to that of refugees within the United States. That is, there exists a difficulty obtaining mental health services.³

A bitter example of a soldier in Fort Carson, Colorado exemplifies the state of mental health awareness in the military. This soldier had shown clinical conditions of depression and anxiety, and had experienced mental breakdowns while on duty in Fort Carson. He said that upon hearing his symptoms, higher officials showed no interest and fellow soldiers even started to haze him. It is disheartening to real-

ize that social stigma and lack of care from higher officials have reduced the effectiveness of mental health programs.

A study by the Government Accountability Office (GAO) found that 80 percent of soldiers who were found to have symptoms of PTSD were not referred to mental health specialists upon their return to America or even at their army bases. Moreover, there is a lack of sufficient mental health establishments and counseling programs to treat the returning soldiers. Mental care facilities are currently so overwhelmed with the influx of individuals from Iraq and Afghanistan that some soldiers are told to wait as long as a month before they can receive it.⁴

The fact of the matter is that many soldiers returning from Iraq and Afghanistan are suffering from symptoms of post traumatic stress disorder (PTSD) along with other mental health symptoms.

Evidently, there exists a tremendous mental health risk for returning soldiers who are disproportionately suffering from emotional and mental disorders. The Assistant Secretary of Defense for Health Affairs in the Bush administration, William Winkenwerder, outlined the goal for identifying problems within the established mental health programs, provision of immediate support, and the restoration of proper mental health.⁴ But undoubtedly, returning soldiers are not experiencing the immediacy of support that is promised to them, which can catalyze a plunge into a state of greater mental health problems. Despite this promise from the government for heightened sensitivity and attention to mental health, only one-third of returning soldiers who needed care in 2003 and 2004 actually received medical attention.⁵

Almost six years later, when the country remains in a similar military position, one would hope that a more effective solution to the problem would be proposed. During his

presidential campaign, Barack Obama made a passionate speech in Charleston, West Virginia about the insufficient quality of mental health care that awaits war veterans under the Bush regime. During the speech, he clearly recognized and intended to address the mental health needs of American soldiers, stating that more services and establishments need to be set up for soldiers and veterans. He promised in his presidency to “fully fund VA health care, add more Vet Centers, allow every veteran into the VA,...enhance mental health screening and treatment at all levels, more mental health professionals,...more training to recognize signs, and to reject the stigma of seeking care.”⁶ His administration since then has been successful in substantially increasing the budget for Veterans Affairs (VA) by 25 billion dollars, appointing new, more suitable leaders into office, and increasing the number of mental health specialists for soldiers and veterans.^{7,8,9} To address the alarming degree of social stigma that surrounds mental health disorders in society, the Obama administration has aimed to reform the dynamic of the VA to one of more transparency so that more public attention is given to PTSD and other issues.⁹ However, there is still a massive backlog of veterans yet to receive care, a steady rate of persisting suicides in the forces, and a considerable number of veterans who are unable to access and receive care.⁷ Despite the increased efforts, many of the president’s original promises have yet to materialize. This is a significant concern given that an additional 300,000 troops will be deployed to Afghanistan during 2010.¹⁰

But, what if the headlines of tomorrow’s paper explained that our heroic soldiers are suffering from the same lack of access to mental health services as a faceless group of refugees?

The August 2007 Army Suicide Event report noted that there might exist a “significant relationship between suicide attempts and number of days deployed in Iraq, Afghanistan or nearby countries where troops are participating in the war effort.”¹¹ This is shocking, considering the Obama administration’s recent decision for more deployment and a plan to dramatically increase the war budget.¹² Furthermore, it highlights the crucial public health need for effective intervention mechanisms, namely in the implementation of rapid diagnostic testing and immediate referral to mental health care providers and facilities. The Obama administration’s promise to provide such fundamental care must be brought to fruition in this critical period of increased military deployment.

While this basic foundation of mental care is an unques-



Photo courtesy of Rajaa Qadri

tionable necessity, alternative methods of therapy may also alleviate the burden of emotional and stress-based disorders for returning soldiers. For example, various holistic health medical centers have implemented integrative therapy for those suffering from mental health disorders; specifically the Sameuli Institute in Washington D.C., which has developed a program known as VET-HEAL. This integrative healing approach utilizes interventions which may include yoga, acupuncture, guided imagery, and meditation. Such treatments, which have minimal or no side effects, may be initiated early, and many of these techniques may be self-administered, thus empowering soldiers to help themselves with their personal struggles.¹³

As we enter this new decade, it is our national responsibility to advocate for the development of effective health care services for returning US soldiers and ensure that their mental health care needs are met. In addition, we should be open to alternative and integrative therapies that heal the mind and body as a collective living unit and understand the specific vulnerabilities of individuals exposed to conflict traumas. These, among others, are just a few examples of reforms that should be implemented to serve our returning heroes. Almost 700,000 soldiers return from Iraq and Afghanistan exhibiting symptoms of PTSD and other traumatic brain injuries.⁷ What more valuable way is there for their country to repay them, if not by providing this most basic amenity?

To read “Cultural Incongruence” or to access full articles published in past editions of *Epidemic Proportions*, visit www.jhu.edu/EP.

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EDITORIALS

Saving Lives Through Ignition Interlocks

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For decades, we have been inundated with horrific statistics about drunk driving. Although we have heard the facts before, the repercussions are no less hard-hitting. When reduced to the bare facts, drunk driving is still wiping away our friends and neighbors. In Johns Hopkins University's home state of Maryland, alcohol was involved in one quarter of all traffic fatalities in 2008, killing 152 people.³ In 2000 alone, alcohol-related accidents caused 13,570 fatalities and more than 360,000 nonfatal injuries. Almost 10% of those involved in an accident experienced incapacitating injuries or injuries that affect quality of life and productivity (Figure 1).⁴

No personal tragedy can be conveyed purely by these statistics, however. That reality hit home this year at the Johns Hopkins University Homewood campus when Miriam Frankl, a remarkable 20-year-old double major in Cellular and Molecular Biology and Spanish, had her life taken by a hit-and-run driver on the 3500 block of St. Paul Street, on October 17, 2009.

If better methods are not implemented to prevent drunk driving, such incidents will continue to rob people of their lives, families of their loved ones, and this world of individuals like Miriam, who would have contributed greatly.

Although there is no remedy for past wrongs, there may be hope for reducing the number of such injuries and fatalities in the future. Currently, Maryland does have the standard state laws against drunk driving. These include both a "driving while impaired" (DWI) offense, for drivers with a blood alcohol concentration (BAC) of between .07 and .08, and a more serious "driving under the influence" (DUI) charge, for those with a BAC of .08 or more. In addition to 8 points on the driving record and possible license suspension, the lesser DWI conviction is punishable by a \$500 fine and up to 60 days in jail for a first offense, and up to one year in jail for a second offense.⁵

In the US, one person is killed every 40 minutes in an alcohol-related motor vehicle accident.¹

The more serious DUI charges carry a maximum penalty of one year of incarceration and a \$1,000 fine for the first offense, two years and a \$2,000 fine for the second offense, and three years and a \$3,000 fine for the third offense.⁶ Despite these laws, there is an alarmingly high rate of recidivism among convicted DUI and DWI offenders. For

Type of Injury	GES*
Possible Injury	3.5%
Non-incapacitating Injury	6.4%
Incapacitating Injury	9.8%

Figure 1: Alcohol-Related Injuries

*The General Estimates System (GES) "collects data on a sample of all police-reported crashes, without a specific set of vehicle and severity criteria. Although GES collects data on a broader array of crashes, it collects less information on each crash, limiting possible analysis of alcohol involvement. Cases are restricted to a simple "yes," "no," or "unknown" alcohol indication on the police crash report, as observed by the reporting police office. Actual BAC test results are not available through the GES sample."

Source: Blincoe, Lawrence J., Angela G. Seay, Eduard Zaloshnja, Ted R. Miller, Eduardo O. Romano, Stephen Luchter, and Rebecca S. Spicer. "The Economic Impact of Motor Vehicle Crashes 2000." U.S. Department of Transportation, National Highway Traffic Safety Administration (2002). Print.

example, as of April 2008, 25,120 Marylanders had been convicted three or more times of DWI. Of these, 3,980 had five or more convictions, 62 had 10 or more, three had 15 or more, and one had 21 convictions of DWI.⁷

These 25,000 Marylanders are 25,000 more reasons to strengthen laws aimed at prevention of drunk driving, yet injury and death rates continue to glare out of annual reports as a result of inadequate prevention. A change in strategy is in order: A mix of preventative methods is necessary, and one of the essential ingredients in that recipe for prevention is a combination of legislation and technology.

The absurdly large number of repeat convictions can be controlled through the implementation of mandatory ignition interlocks for repeat offenders. Reminiscent of the ever-popular breathalyzer used by police officers, an ignition interlock requires that the driver blow into it before starting the car. Ignition interlocks serve, in effect, as a probation officer in the passenger seat, randomly testing the driver's BAC once the vehicle is started. If the device detects an unacceptable BAC, it prevents the car from starting, and if the car is already in motion, it gives visual and/or auditory alerts to law enforcement to signal the failure of the test. It always records the BAC of the driver, which can be used as evidence in court. The device costs the offender less than a mere \$3 per day, which is trivial compared to the cost of a life.⁸

Judges in Maryland currently have discretion to order the use of ignition interlocks, and approximately 7,900 drivers are now being required to use them. Nevertheless, in most states, ignition interlocks are not mandatory even for drivers with multiple DUI and DWI convictions.⁹ However, in the 12 states that have adopted the program as of 2010, results

are far more than promising. New Mexico, the first state to institute such a program, experienced a 65% decrease in recidivism. In New Mexico, where ignition interlocks are mandated upon the first offense, drunk-driving fatalities decreased by one third.¹⁰

Maryland has a responsibility to consider emulating New Mexico and its 12 successors before more lives are taken by drunk drivers, and will be reviewing this law in the upcoming legislative session in Annapolis.¹¹

The law should be implemented, requiring DUI and DWI offenders to use an interlock device. Furthermore, some preliminary conditions should be enacted:

1. As in New Mexico, the judge should direct the offender to a list of ignition interlock providers, after first requiring that the offender obtain a special license. The license would be obtained by filling out an application at the Motor Vehicle Administration, and would allow for better data collection and statistics regarding the ignition interlock system. After obtaining the license, the offender would go to a vendor to have the device installed.

2. If a person refuses to get an ignition interlock installed on his or her car and continues to drive, he or she would be doing so illegally and should be subject to harsher penalties. New Mexico's penalty for this is the same as that of driving with a revoked license, the severity of which depends on the number of previous offenses and ranges from jail time to substantial fines. Such a policy should also be implemented in Maryland. However, in order to ensure that a person does install an ignition interlock, the car should be impounded until the driver obtains an ignition interlock license, at which point the car should be released directly to an ignition interlock contractor so a device may be installed.

In 2007 alone, 32 percent of all traffic fatalities were directly attributed to alcohol.²

3. If a person is driving a car that he or she does not own, the penalties should be even more severe. The driver's license should be revoked, but the penalty should also go beyond that. For example, in Maryland, when a license is revoked because of a DUI, the driver must enter an Alcohol Education Program before applying for a new license. Upon completion of the program, the driver can reapply for a new license. In addition, the person should also face mandatory jail time, have their license revoked for a minimum period set by the judge, and be forbidden from ever driving again without an ignition interlock.¹²

One of the key components of public health is prevention,

and it is clear that drunk driving is a preventable problem, to an extent. There is no reason why Maryland, and every other state, should not do everything in its power to prevent future alcohol-related tragedies. We have already lost too many friends and loved ones such as Miriam Frankl, and must learn from these tragedies to prevent future losses. Ignition interlocks are a proven, cost-effective step towards prevention, and must be mandated to protect the lives of citizens. How many more lives must be lost to drunk driving before Maryland takes the appropriate measures to protect them?

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Thank You,
Johns Hopkins University Alumni Association!



Photo courtesy of Lester Kao

Greetings from Antarctica

Assessing Environmental Impacts from Rising Rates of Tourism

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Seasoned travelers, addicted to the thrill of discovering unspoiled territories, have left their marks in remote corners of our earthly landmasses and the depths of our marine forests. Imagine that as little as twenty years ago, places like Madagascar, Kenya, and Laos were considered inaccessible; yet today, even the most exotic travel destinations boast virtually every variety of vacation, even ecologically respectful excursions, known paradoxically as “ecotourism.”

The vast continent of Antarctica now attracts thousands of so-called “ecotourists” every year, and experts say that this frozen landscape will draw more and more visitors as cruise liner capabilities increase.

This mislabeled societal trend has widely dismayed dedicated preservationists, specifically Antarctica-philes, who are knowledgeable about the specific vulnerability that the Antarctic ecosystem faces in light of increasing ecotourism.

The Ecotourism Society (TES), an organization developed in the United States twenty years ago in 1990, has formally defined the concept of ecotourism as:

Purposeful travel to natural areas to understand the culture and the natural history of the environment, taking care not to alter the integrity of the ecosystem, while producing economic benefits that make the conservation of natural resources beneficial to local people.¹

In certain cases, the economic benefits provided to local communities, matched with a unique experience in cultural immersion for tourists, deems ecotourism a successful and even sustainable enterprise. However, the optimistic definition presented by the TES does not do justice to the multifarious implications of increased tourism to remote and indigenous destinations.

For example, the once-lonely continent of Antarctica currently averages 40,000 visitors each year, a number that is expected to double to 80,000 by the end of 2010. Since the first commercial sailing voyage to Antarctica in 1958, the number of tourists has been dramatically increasing due to

greater accessibility, decreasing prices of travel packages, and an overall societal desire to see the ends of our earth.² Experts on Antarctica’s tourist industry fear that between the high-capacity cruisers and the smaller ships that can maneuver through the rugged and icy Southern Seas, the growing industry will not be able to contain itself, even in the face of increasing environmental degradation.³

The long-term environmental costs of the estimated 80,000 ecotourists expected on the fragile continent in 2010 remain unknown, and could devastate the last great wilderness that we know. A large-scale study found that Winter Quarters Bay near McMurdo Station in Antarctica was highly contaminated with petroleum hydrocarbons, polychlorinated biphenols (PCBs), and phenylthiocarbamides (PCTs), which are toxic to animals.⁴ The presence of such environmental contaminants demonstrates the ubiquitous anthropogenic consequences that increased human travel poses for pristine ecosystems. A team of researchers from the University of Auckland further demonstrated that fish caught in the same Winter Bay waters contained much higher levels of hydrocarbons in their livers than fish from other areas, as well as an ion imbalance in their blood chemistry that may result in structural and functional damage to the gills.⁵ Such shocking evidence of environmental pollution on a continent that lacks an indigenous population demonstrates the dissonance of ecotourism’s inherent values.

The long-term environmental costs of the estimated 80,000 ecotourists expected on the fragile continent in 2010 remain, and could devastate the last great wilderness that we know.

The continent of Antarctica has proven to be the earth’s most significant natural laboratory, with our ecological history locked within its four-kilometer-thick ice sheets.

These fragile landforms hold a unique record of changes in our planet's climate over the last one million years and offer insight into the contentious issues of climate change. In addition to its scientific research value, Antarctica represents our last veritable frontier, home to the celebrated emperor penguins and regal humpback whales as well as to thousands of unique flora species absent on every other continent. In fact, a British Antarctic study conducted in 2008 found more than 1,200 marine and land species, including sea urchins, free-swimming worms, crustaceans, birds, and mammals, celebrating Antarctica and its surrounding chain of islands as an ecosystem with more biodiversity than that of the Galapagos Islands.⁶

But climate change experts argue that this increase in tourism promotes environmental degradation that extends well beyond Antarctica's own ecosystems. The realization of Antarctic tourist booms has influenced the development of policy that focus on Antarctica's maintenance, whereas the global environmental health implications have been largely ignored. Recent research demonstrates that the greenhouse gas emissions from Antarctic tourism are substantial due to the dependence on "long-hail" aviation and cruise travel. These trips rank among the most energy-intensive sectors on the tourist market, yet greenhouse gas emissions are not required in environmental impact assessments conducted by tour operators.⁷ Suddenly, the need to implement Antarctic tourism policies becomes a matter of our own international sustainability, not solely the preservation of local Antarctic ecosystems. Once this vacation trend begins to impact our own environmental capacity, perhaps we will be keener to advocate for change.

In regard to what has been done to slow down the environmental damage, the International Association of Antarctic Tour Operators (IAATO) has developed guidelines for all tourists as well as tour operators who set foot on Antarctic grounds. However, the various treaties and guidelines that have been implemented concerning Antarctic tourism lack practical advice on how best to avoid disturbing flora and fauna and may not safeguard the continent from pollution if the trends in tourism continue. In the end, due to Antarctica's significant distance from any law-enforcing agencies, the effective management and regulation of ever-increasing groups of ecotourists depends primarily on the good will

and dedication of the industry tour operators and decisions of individual tourists. Discussing the potential effects of increased Antarctic tourism, Machiel Lamers of the International Centre for Integrated assessment and Sustainable development (ICIS) states, "The South Pole is managed by an international consortium of countries, but no one is really in charge on the ground. There is no policy outlining any limits for tourism."⁸

The enormous increase in Antarctic tourism demonstrates an irrefutable necessity for a binding international treaty that limits the number of tourists and landings allowed in Antarctica. This legal document must implement judicious and site-specific regulations for tourist visits based on the fundamentals of sustainable tourism. However, the designation of formal legislation does not remove the potential or need for additional creative solutions. For example, there could be a requirement for industry tour operators to donate a portion of their revenue to an Antarctic research fund or to integrate an educational component to Antarctic cruise vacations that highlight the importance of ecosystem preservation. In any case, much more must be done as our innate human passion for exploring uncharted territory materializes through increased travel to the ends of our earth. We must reevaluate the values of so-called ecotourism; otherwise, we will love our mother earth to an untimely death.

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Photo courtesy of Halshka Graczyk

