

# EPIDEMIC PROPORTIONS

The Johns Hopkins Undergraduate Public Health Research Journal

Vol. 9, Spring 2012



THE PRICE  
*of*  
PROGRESS

## ABOUT THE JOURNAL

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

Take a look at our past issues on our website at [www.jhu.edu/ep](http://www.jhu.edu/ep).

## SUBMISSIONS

We publish any student experiences locally or abroad, whether it is research, volunteer work, or an editorial. We also publish faculty research and perspectives.

To submit an article or request more information about submission procedures, we encourage you to contact [ep@jhu.edu](mailto:ep@jhu.edu).

*Cover: Photo of farmland and  
development in Kathmandu, Nepal,  
taken by Rose Khin Mee Mee Win*

# TABLE OF CONTENTS

## INTRODUCTION 4

Letter from the Editors — 4

Cover Letter — 5

## RESEARCH 6

Land Use Integration in Malaria Risk Monitoring

*Keith R. Spangler — 8*

A Clinic on Castro Street

*Rachel Burns — 11*

Breaking Barriers to Global Measles Elimination

*Annie Tsay, et al — 15*

The Implications of Environmental Tobacco Smoke on Lung Transplantation

*Shant Keskinyan — 20*

## PRINCIPLES & POLICIES 24

When It Comes to Sugar, I'll Go With the Danish

*Laura Quigley — 26*

A Challenging Road Ahead for Comparative Effectiveness Research

*Danielle M. Whicher — 28*

The Development of the Private Healthcare Industry in China and the Implications of Government Reforms

*Kevin Wang — 31*

Political Bottom-Up Approach to Global Health Problems

*Sindu Ravi — 35*

## FEATURES 38

Sub-Saharan Migrants & Morocco

*Brittany Bland — 40*

The Real Homestay Partner: A Husband

*Lauren Villa — 42*

Water Losers

*Megan Hawes — 44*

How to Grow an Independent Study Project in the Desert

*Andrew Wilbur — 47*

## PERSPECTIVES 52

Exploring Risk-Taking and Risk-Avoidance from a “Whole Person” Vantage Point

*Dr. Jacinda Dariotis — 54*

Global Decade of Action for Road Safety 2011-2020

*Dr. Adnan Hyder — 60*

The Risks of Breathing

*Dr. Roger D. Peng — 62*

## EDITORIALS 64

Connecting the Public

*Brian Stackhouse — 66*

The Kids Are All Right

*Saznin Mehta — 68*

Holding Hands with Angels

*Sandhira Wijayarathne — 71*

South Africa and Its Natives

*Michael Dawedeit — 73*

Acknowledgements — 75

Staff — 76

# LETTER FROM THE EDITORS

Welcome to Epidemic Proportions!

In our last issue, we presented public health efforts “breaking barriers” across the globe. This time, we seek to highlight the toll humanity pays for breaking those public health barriers and to remind ourselves that advancement is not the end – in fact, any development will also bring forth new challenges to confront. With the merit of research and perspectives of esteemed faculty and driven students, we seek to illustrate the price of progress: the creation of new, unforeseen public health challenges that emerge as societies develop.

The eclectic pieces in this journal bring this idea to light. The articles highlight issues such as the impact of deforestation on infectious disease vectors, resistance to tuberculosis treatment, and the growing possibility of global measles elimination faced by the developing world. At the same time, the journal also showcases problems facing more developed countries, such as obesity, ambient air pollution, and issues regarding road safety. Together, these articles provide a deeper understanding that both developed and developing countries face unique challenges to the improvement of public health.

Johns Hopkins University and Epidemic Proportions share a passionately held belief that public health is best understood as a crossroads, a platform to bring together different disciplines in order to bring science to social justice and address the problems that plague our world. The contributors to this issue have invested a great amount of time and effort in order to investigate these public health problems from locales as far as the slums of Kibera to those of our very own Baltimore city. We hope the journal will serve as an invitation to provoke critical thought, reflection, and discussion on public health issues faced by nations as they evolve and transition into development. The time for public health is now – in not only developing countries, but also in developed nations.

Epidemic Proportions was born from the vision of a few students committed to capture the rich diversity of the Johns Hopkins public health experience. The journal published its first issue less than ten years ago and has thereafter continued to gain momentum and recognition in not only the undergraduate campus, but within the graduate schools as well. Working on the Epidemic Proportions team this past year has been, above all, an inspirational experience. It has been our privilege to work alongside students and faculty with such genuine dedication to the future of public health. This journal is a product of this very passion - shared by the authors, the EP staff, our advisors, and you, the reader.

We invite you to join this discussion with our latest issue of Epidemic Proportions, *The Price of Progress*.

Sincerely,



Sheerin Habibullah  
*Editor-in-Chief*



Pujan Dave  
*Editor-in-Chief*

# COVER LETTER

It is likely that William Welch, one of the legendary founding physicians of Johns Hopkins Hospital, started dreaming of a school of a public health before he even arrived in Baltimore. In 1884, he wrote to Hopkins' first president, Daniel Coit Gilman, while on a research trip to Germany, extolling the virtues of the "hygienic institute" of Munich and adding, "I hope that we may have a similar institute in Baltimore." It took more than 30 years for his far-sighted vision to come to life – and he thankfully helped build our medical institutions in the interim – but his aspiration helped shape both the nation's first such institute, the Johns Hopkins School of Hygiene and Public Health, and a burgeoning academic field.

Others had envisioned such a school as a practical training ground for state and local health officers, a place to shore up functional skills. At the start of the 20th Century, physicians, engineers and health advocates were coming together to improve sanitary conditions in cities wrestling with the rising tolls of urbanization and immigration. In southern states, increasingly organized groups were battling the persistent scourge of hookworm. These efforts strengthened the size and organization of national, state and local health efforts, and reformers agreed better training was needed to spur additional progress. But from the outset, Welch understood the field in its broadest terms, dreaming of a research-oriented institution where scholars could also take on original investigations of health-related challenges.

In 1915, as the Rockefeller Foundation was considering its philanthropic support for a public health institute, foundation leaders turned to Welch and a collaborator for a report outlining their recommendations. The authors admitted that the field of public health was "so broad and varied that it is hardly possible... to indicate all of the subjects here included." But they went on to offer a stunningly broad list of academic subjects the curriculum should cover, from statistics, epidemiology and the diagnosis of infectious disease, to industrial hygiene, hospital construction, housing, ventilation, heating, lighting, infant mortality, heredity, nutrition, milk supply, farm hygiene, quarantine, immigration, tropical hygiene, social service work, and the hygiene of air, soil, water and climate – among others.

Of course, Welch's expansive list has only grown over time. As societies around the world advance, the impact of public health research has affected not only how we prevent and contain chronic and infectious diseases – from cardiovascular disease to malaria and HIV – but how we build our cities, reduce gun violence, curtail binge drinking, respond to natural disaster and address the critical health needs of some of the most vulnerable communities around the world. In nearly a century, these problems have required collaborations across schools and academic departments. Our own efforts at Johns Hopkins have extended well beyond our East Baltimore campus to enlist scholars in nearly every division of the university – including the passionate and committed undergraduates involved with this journal.

This issue of *Epidemic Proportions*, with its focus on "The Price of Progress," exemplifies the ways in which a new generation has picked up on the breadth and ambition of Welch's vision. These articles explore contemporary health concerns – the effects of taxing soda or alcohol, the bottom-up approach to public health, the implications of environmental tobacco smoke on lung transplantation. But they also echo the fundamental challenges of Welch's day: As the society around us develops at breakneck speeds, how do we assess and manage the impact those changes can have on the health of our populations? I encourage you to read the issue carefully, keeping in mind the remarkable trajectory that our explorations of public health have taken over nearly 100 years.

Ronald J. Daniels, JD, LL.M.  
*President, Johns Hopkins University*





# RESEARCH

# Land Use Integration in Malaria Risk Monitoring

## INTRODUCTION

Deforestation is arguably the most pressing threat to human health and environmental sustainability in South America. With over 20 percent<sup>1</sup> of the Amazon rainforest already cleared for agriculture, urban development, and timber exports, this global haven of biodiversity is among the most sensitive and threatened regions in the world. While numerous studies assess the impact of deforestation on global climate change, sustainable food availability, and economic stability, the literature rarely underscores the implications of deforestation on infectious disease vectors. Given the high incidence of both malaria and deforestation in Peru, the impact of rainforest loss on malaria vectors in the Peruvian Amazon is of particular interest. The World Health Organization warns that malaria can become life-threatening within just two weeks of infection; moreover, many species of mosquitoes are developing resistance to current antimalarial drugs, increasing the need for prophylactic measures.<sup>2</sup> With nearly 90 percent of malaria cases in the Western hemisphere confined to the Amazon, there is a critical need for further study into the anthropogenic influences on these vectors for the ecological comprehension and pragmatic development of early warning systems, detailed risk mapping, and treatment allocations.

While it has been established that deforestation likely increases the breeding of the rainforest's primary malaria



**Figure 1.** Area of interest: road between Iquitos and Nauta, Peru.

vector, *anopheles darlingi*, neither the spatial structure of land uses and land cover changes (LU/LCC) nor the area of influence of LU/LCC on mosquito density has been systematically addressed.<sup>3</sup> The radius of influence that LU/LCC has on mosquito presence is of particular importance, both for the design of warning systems and for informing future malaria transmission studies. Here, preliminary results of a satellite-based analysis of land use patterns and mosquito density along the Iquitos-Nauta road in the Peruvian Amazon are presented (Figure 1).

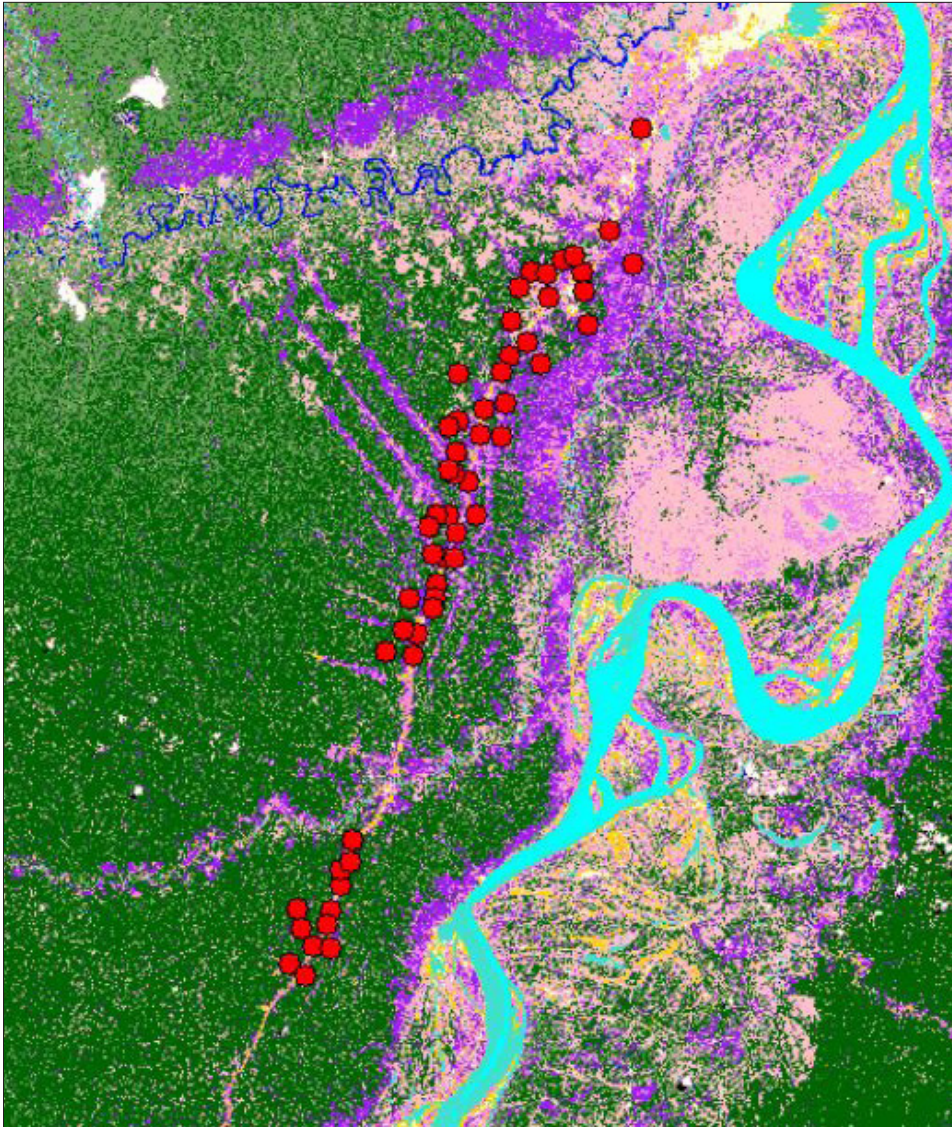
## METHODOLOGY

The large spatial scale of the area of interest made it necessary to obtain satellite images covering the entire expanse

of land between the cities of Iquitos and Nauta. Figure 1 shows a subset of an image of the Iquitos-Nauta Road, provided by the United States Geological Survey, from the satellite Landsat Thematic Mapper 7 in June 2001. Substantial areas of deforested land are apparent even in the unclassified image: the lighter shades of green that are west of the river indicate a “fishbone” pattern of deforestation resulting from logging roads, a common manifestation of rainforest clearing in the Amazon.

In order to assess the different land uses and run a meaningful analysis, a supervised classification was applied to the image using ERDAS IMAGINE, which is a program designed to manipulate and interpret satellite images. Of particular interest were four broad “classes,” or land features: forest cover, deforested land, water, and urban development. The classified image was then overlaid with a shapefile, a layer of the image with user-defined points of interest, containing the UTM coordinates of 56 mosquito collection sites, as indicated by the red circles in Figure 2. Mosquito counts were tabulated *in situ* by Vittor, *et al.*<sup>4</sup> in three hour intervals at least once every three weeks between September 2000 and August 2001 at each of the 56 sites. To assess the land use relative to each of these collection sites, a tool was provided by USGS called “Tabulate Features to Percent,” which ran a model that output the different land use characteristics by percent within each of the ten radii used as “buffers” (250 – 8,000 meters). The output of this model was used in the





**Figure 2.** “Buffer” regions were analyzed at various radii ranging from 250 to 8,000 meters to calculate the proportion of deforested land relative to each mosquito collection site along the road.

statistical analyses described in the following section.

## DATA ANALYSIS

Two statistical methods were employed to analyze the land use features around each site. The first approach grouped the collection sites into “bins” of nearest 10 percent level of deforestation; all sites surrounded by land that was 14 percent deforested, for instance, would be grouped in the 10 percent bin, all sites surrounded by land that was 28 percent deforested would be grouped in the 30

percent bin, and so on. For each radius, a linear regression model compared average number of mosquitoes at the sites within each bin against the corresponding rate of deforestation. The coefficients of determination from each model were plotted against the corresponding radius of influence. These data are displayed in Figure 3: the right graph shows the number of mosquitoes found at sites contained within regions of 10, 20, 30, 40, and 50 percent deforested land at 6000 meters. At this scale, there is a strong correlation ( $r = .97$ ) between the number of mosquitoes and amount of

deforestation.

The seemingly logarithmic nature of the left function implies that there exists a radius at which the influence of land use features is at a maximum for identifying the presence of mosquitoes; in other words, at a certain point, increasing the radius yields no more significant correlation between deforestation and

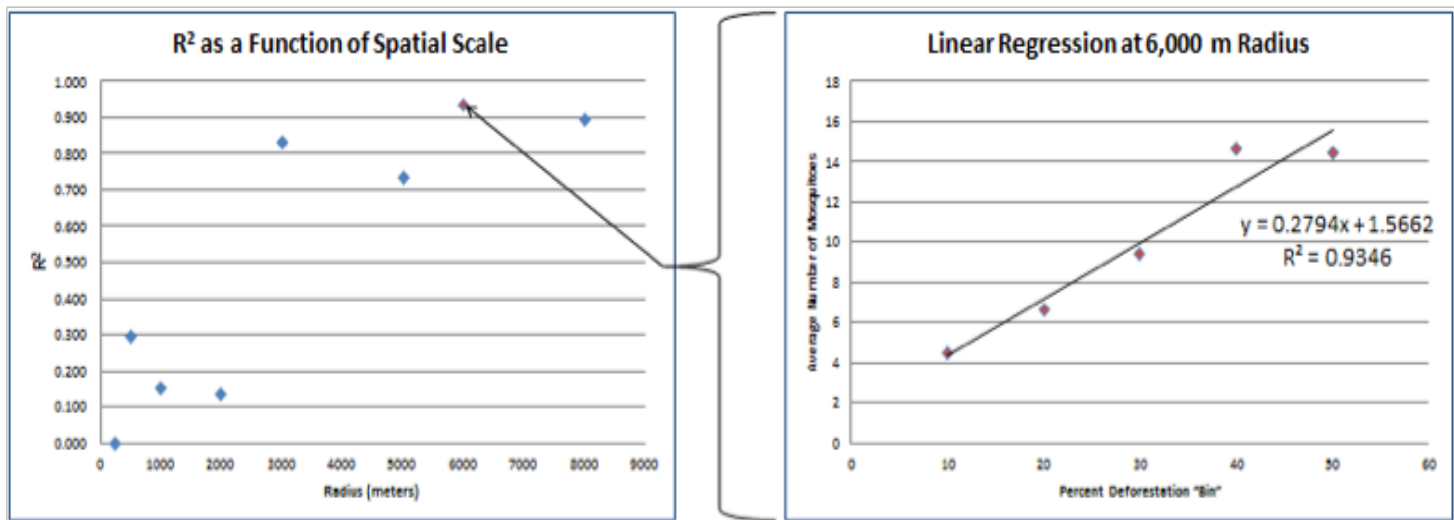
---

**On average, at a spatial scale of 6,000 meters, a 1% increase in deforestation raises the odds of malaria-carrying mosquito presence by 5%.**

---

mosquito presence. Notice what appear to be two sets of data points: the four points corresponding to radii 250 meters to 2000 meters and the remaining four points with higher R2 values. This suggests that there are two phenomena occurring: one local-scale effect and one regional-scale effect. The data suggest that mosquito presence is more highly correlated with rate of deforestation (thereby serving as a better indicator of malaria vector presence odds) at spatial scales of 3000 or more meters.

To verify this finding, a model was coded in STATA (a statistical programming language) that analyzed the buffers through a logistic regression with a random intercept, using adaptive quadrature. This model accounted for spatial autocorrelation, a phenomenon whereby spatially proximal observations confound one another’s influence on the measured variable. The outputs



**Figure 3.** Deforestation and mosquito presence is most highly correlated at a radius of 6,000 meters.

of importance from this model were the odds of presence at each radius and its corresponding p-value. The former output variable describes the extent of the influence of the radius on the odds of binomial presence or absence of mosquitoes; the latter is a statistical measure of the confidence in this influence (a lower p-value indicates greater confidence). For the regression model, “presence” of mosquitoes was defined as ten or more mosquitoes counted at the collection site. With this condition, the regression yielded a parabolic function with a local maximum again at 6,000 meters. At this radius, the odds of mosquito presence is 1.05 (CI: [1.029–1.08]) with a very significant p-value of less than .000, where a p-value of 0 indicates absolute certainty of correlation. Therefore, on average, at a spatial scale of 6,000 meters, a 1% increase in deforestation raises the odds of malaria-carrying mosquito presence by 5%.

## DISCUSSION AND RECOMMENDATIONS

Prior to this study, the vast majority of papers that sought to resolve the link between deforestation and malaria risk considered spatial scales only up to one

kilometer from the site of deforestation. As the data show, Anopheles presence risk continues to increase far beyond a one-kilometer radius and, in fact, does not plateau until at least six kilometers. In terms of detailed risk mapping, it is crucial to recognize that the influence of cleared land continues to increase the likelihood of malaria vectors beyond a kilometer from the site of deforestation. Since existing risk assessments may not consider areas several kilometers away from deforested land to be at an elevated chance of having malaria-carrying mosquitoes, it is important for policymakers to take these areas into account when allocating prophylactics and treatments to their citizens. The current literature can benefit from future studies comparing the effect of deforestation on non-vector mosquito species, as well as other less common malaria-vector mosquito species in order to contribute further to the knowledge necessary for informed risk mapping and treatment allocations.

tion. <http://www.who.int/mediacentre/factsheets/fs094/en/index.html>. 2011. Accessed November 23, 2011.

3. Zaitchik B, Pan W, Kosek M, et al. Development of a detection and early warning system for malaria risk in the Amazon. National Aeronautics and Space Administration Research Announcement NNH10ZDA001N-PHFEAS. Research proposal. 2010. Unpublished.
4. Vittor AY, Gilman RH, Tielsch J, et al. The effect of deforestation on the human-biting rate of anopheles darlingi, the primary vector of Falciparum malaria in the Peruvian Amazon. *The American Journal of Tropical Medicine and Hygiene*. 2006;74(1):3-11.

1. Kingstone, S. Amazon destruction accelerating. BBC News. <http://news.bbc.co.uk/2/hi/americas/4561189.stm>. May 19 2005. Accessed May 18, 2011.
2. Malaria fact sheet. World Health Organiza-

# A Clinic on Castro Street: The Importance of Community Involvement in HIV Prevention

---

HIV prevention in the United States is not a one-size-fits-all solution. The interventions and programming that are effective within a certain population in a specific city cannot be extrapolated to all at risk and seropositive populations. Through the Woodrow Wilson Undergraduate Research Program, I was able to investigate this theory by traveling across the country in an attempt to understand HIV prevention methods thirty years after the epidemic first arose in the United States. The basic aim of my project was to look at the ways in which HIV/AIDS prevention has been implemented in different cities and how a 'one-size-fits-all' method of HIV/AIDS prevention is neither realistic nor efficacious. Cultural beliefs, sexual orientation, ethnic differences and overall varying views on disease and sex can lead to very different outcomes across just the United States. When there is resistance to prevention, treatment, and HIV/AIDS education, where does responsibility lie? Should the burden of disease prevention fall on state or city government, academic institutions, non-profit organizations, or the citizens of each city? What makes an intervention effective, and how can, or should, it be replicated in other cities and environments? In order to answer these questions, I decided to go back to the beginning. I started my research in the epicenter of the HIV/AIDS crisis, San Francisco, where the disease first appeared in 1981.

## UNDER THE GOLDEN GATE

San Francisco is an area where HIV is not an uncommon topic. The history of the disease in this city has been incredibly well documented through books, medical literature, and, more recently, documentary films. However, the city is disproportionately affected in terms of what regions (or, more specifically, neighborhoods) are living with HIV/AIDS. The burden is concentrated in four major neighborhoods: the Castro, the Mission, Western Addition and the Tenderloin. In addition, approximately three quarters of HIV cases in the city are attributed to men who have sex with men (commonly referred to as MSM), a population which has a stronghold in one of the most highly affected neighborhoods, the Castro. HIV in this predominately MSM community is not a disease of the past or one that is completely managed by preventative practices and antiretroviral treatment.

Approximately 411 new cases of HIV were diagnosed in 2009, according to the San Francisco Public Health Department, and while 90% of these positive diagnoses were male, 73% were also attributed to MSM. The fact that the majority of new infections reside in MSM is concerning.<sup>1</sup>

It is not true to assume that this epidemic in modern San Francisco only resides in the MSM population, as infection rates are also on the rise among females and African Americans through-

out the city. However, the MSM community in particular, in part due to its deep roots in San Francisco and prominence in the Castro neighborhood, and in part due to its slowly declining rates of HIV infection, presents an interesting public health quandary. Therefore, my research in San Francisco was focused on attempting to gain an understanding of what methods of HIV/AIDS prevention exist today

---

## Should the burden of disease prevention fall on state or city government, academic institutions, non-profit organizations, or the citizens of each city?

---

for the MSM population of the Castro and the greater San Francisco area, and what barriers exist to both testing and treatment.



*Photo courtesy of Clint Hall*

---

**Magnet has become more a social gathering place than an HIV clinic because of both how it was designed, and more importantly, how it has been run.**

---

### **A CLINIC IN THE CASTRO**

In order to spend extensive amounts of time within organizations working to promote HIV prevention and testing, I began my work with an internship at the San Francisco AIDS Foundation, one of the first HIV/AIDS relief organizations formed in San Francisco. Through my internship, I was able to connect with many leading experts in the HIV/AIDS field in the city. The most important interviews that I conducted took place at the Magnet Clinic in the Castro neighborhood of San Francisco. Located right on 18th Street, in the middle of the com-

mercial district, Magnet is a clinic that remains connected to the San Francisco AIDS Foundation, but operates solely in the Castro as a gay men's health clinic. At Magnet, I worked with its director, Steve Gibson, who helped me to understand not only the plan under which Magnet was developed, but also its daily routine. Its modern and sleek design leaves the constantly crowded building with the air of more of a community center or coffee shop than an HIV clinic. The staff is warm and welcoming, and privacy remains the key to its incredible functionality. Within 20 minutes, clients are ushered in and out, while pausing to

look at ads for other HIV organizations and community activities, and information is offered by residents of the Castro rather than strangers.

Magnet has become more a social gathering place than an HIV clinic because of both how it was designed, and more importantly, how it has been run. While speaking to several clients at Magnet, the words “home”, “comfortable”, and “safe” kept creeping into each interview. HIV was a welcome topic. As I was once told by a client: “Here, knowing your status is part of life. It’s better that you find out here than anywhere else.” During my time at Magnet, I observed many patients wander in and out, some appearing more apprehensive than others, but none were treated as outsiders. The free prevention and testing services were extended to each individual who walked in the door amidst conversations about dating, men, and life; HIV is slipped into normal conversation. Magnet fits in among many of the stores and bars that run along Castro Street; however, instead of selling jeans or beer, it is selling HIV prevention from one friend to another.

The leadership of this clinic has created an environment that does not seem foreign or intrusive, but rather a part of the social networks that already existed in the Castro. However, creating a community clinic is not a simple concept. I learned that Magnet was developed not through a sole organization like the San Francisco AIDS Foundation, but was instead formed by a community board of residents of the Castro and designed to fit the specifications set by this panel. Its creation was delayed for years due to internal struggles over what it should look like, what services it should provide, and even what prevention services should be advocated for, but the result was far better than what was predicted. This community-based design struc-

ture allowed Magnet to look more like a storefront than a community health center bent on decreasing HIV transmission within the MSM community. More importantly though, Magnet’s success can be attributed to listening to what the Castro wanted in an HIV clinic, rather than what they were expected to respond to. In 2007, the Magnet clinic reported serving over 7,200 men per year for HIV and STI testing, and demand continues to exceed capacity by 30%. In addition, the follow-up rate for continued HIV and STI care remains steady at 99%.<sup>2</sup> Magnet is a shining example of what can be accomplished by listening to the populations most affected by HIV, rather than assuming what their needs are.

### **HIV PREVENTION ACROSS THE CITY: ONE SIZE DOES NOT FIT ALL**

The most impressive quality of the San Francisco system is its focus on social networks as a mechanism for advocating prevention, a common thread among prevention programs other than the Magnet clinic. While the public health department advocates a strategy for the city that is incredibly overarching and not specifically neighborhood-based, smaller organizations in the city promote HIV awareness through smaller organs. The San Francisco AIDS Foundation houses multiple programs that vary from the Speed Project for at-risk and seropositive methamphetamine users to the Black Brothers Esteem program aimed at African-American MSM. Specifically, the Black Brothers Esteem Program places a significant focus on reducing the number of members without permanent living situations and getting them equal access to HAART therapy. While the Black Brothers Esteem Program may seem like the ideal model for the African American MSM community sometimes estranged from the vibrant world of the

Castro, it does not meet all needs. A former volunteer for the program spoke of those who are “left out” of prevention. He explained that the openly homosexual nature of this program, as with the Magnet clinic, may seem offensive to those who do not regard themselves as belonging to the MSM characterization. While paying attention to a specific group with unique needs contributed to the overall success of these programs, it is crucial to acknowledge that they leave some crucial clients out by narrowing their intended scope of treatment to such a specific population. Magnet was created for the residents of the Castro who are comfortable and open with their sexuality. As the former volunteer explained, “Someone [who] is not open about their sex life would not feel comfortable there. Some people are inevitably pushed away.” There is “no one-size-fits-all” solution for HIV, and while community based interventions have been effective within the San Francisco MSM population, HIV tests and treatment are still not readily available for every at-risk individual.

These interventions follow the community-based model and have shown positive results in utilizing the social network connection to reach individuals who would normally not seek care for themselves. While these interventions are not always successful, the awareness that they have brought to the MSM population is largely responsible for the decreasing incidence rate in the city over time. Through the interviews that I conducted at Magnet as well as with other leaders in HIV prevention in San Francisco, such as public health officials, support groups leaders, academics, operators of the California AIDS Hotline, and other organizations in the city, I was able to gain a good idea on where the great controversies lay within the framework of prevention in the city as well as how



*Photo courtesy of Komal Kumar*

they contribute to the understanding of HIV as a whole in San Francisco. It has become clear that, while these programs are not able to reach everyone in each possible niche, the idea of using community and social networks as mechanisms of prevention themselves is not only unique but effective. The example of the Magnet clinic would be incredibly difficult to reproduce in terms of funding, community cooperation, and time; however, it stands an example of what is possible in domestic HIV prevention.

There is no perfect solution for how

to inform more Americans of the HIV status or to convince them to get tested or to utilize prevention services. Yet, San Francisco's at risk populations are making some significant changes in what services are available to the public and how these messages are communicated. In many efficacious cases, community participation along with a willing population is a necessary combination for visible change in HIV transmission at the local level.

- 
1. San Francisco Public Health Department. HIV Epidemiology Annual Report. Retrieved from: <http://www.sfdph.org/dph/comupg/oprograms/hivepisecc/default.asp>. 2009. Accessed September 20, 2011.
  2. Gibson S, Roe K, Ryan T, Cano A, Gluth D, Wilk M, Blue R, Charfauro S, Hall C. The San Francisco AIDS Foundation: The Magnet Model. San Francisco, CA; 2007.

# Breaking Barriers to Global Measles Elimination

## INTRODUCTION

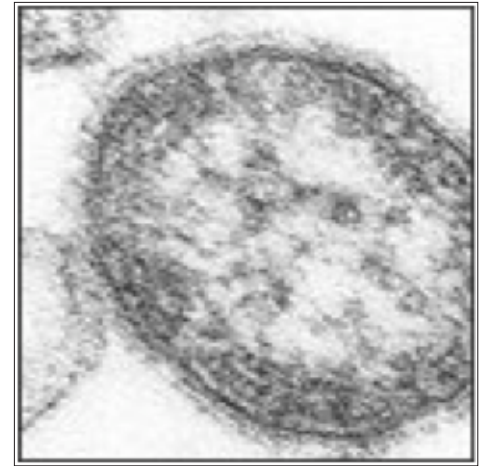
### History

Measles is one of the most contagious human respiratory infections known<sup>1</sup> and remains one of the leading causes of childhood mortality in developing countries, most notably in sub-Saharan African countries.<sup>2</sup> Identification of measles is credited to Abu Becr, an Arab physician, who distinguished it from smallpox in the 9th century.<sup>1</sup> Early documentation suggests that the measles virus probably first emerged between 5,000-10,000 years ago in the Middle East and has been continuously maintained in the human population. The prodromal illness is often characterized by flu-like symptoms, including cough, fever, and conjunctivitis; these symptoms are succeeded by Koplik's spots and the typical measles rash, which is associated with viral clearance (Figure 1).<sup>1</sup> In 1963, a successful live-attenuated vaccine (LAV)

against measles was licensed, but outbreaks continue to occur due to the ease of cross-continental travel, difficulty of vaccine distribution, and decreased vaccine coverage due to the incorrect belief that use of the measles-mumps-rubella (MMR) vaccine is directly correlated with the development of autism.<sup>3,4</sup>

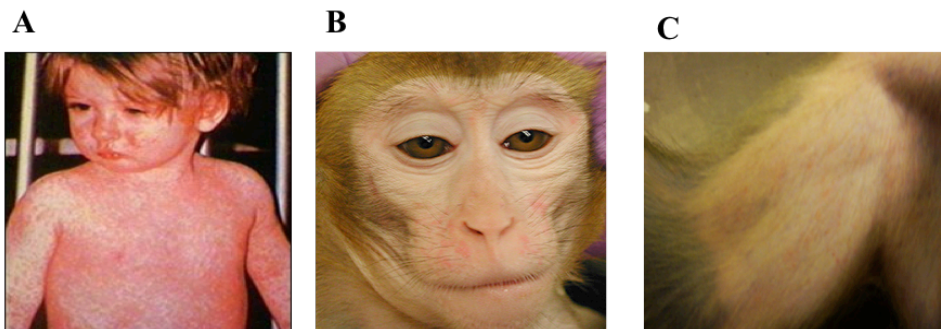
### Epidemiology

High vaccine coverage (greater than 95%) is required to prevent transmission of measles within populations because of its infectious nature; in situations where less than 10% of individuals are susceptible, outbreaks are still possible.<sup>2</sup> Nevertheless, use of LAV has led to a significant reduction in measles: a 48% reduction in overall measles-related deaths from 1999-2004 in Africa was due to mass vaccine campaigns, but these campaigns have been difficult to sustain.<sup>2</sup> Hope for global measles elimination is on the horizon as measles meets the three



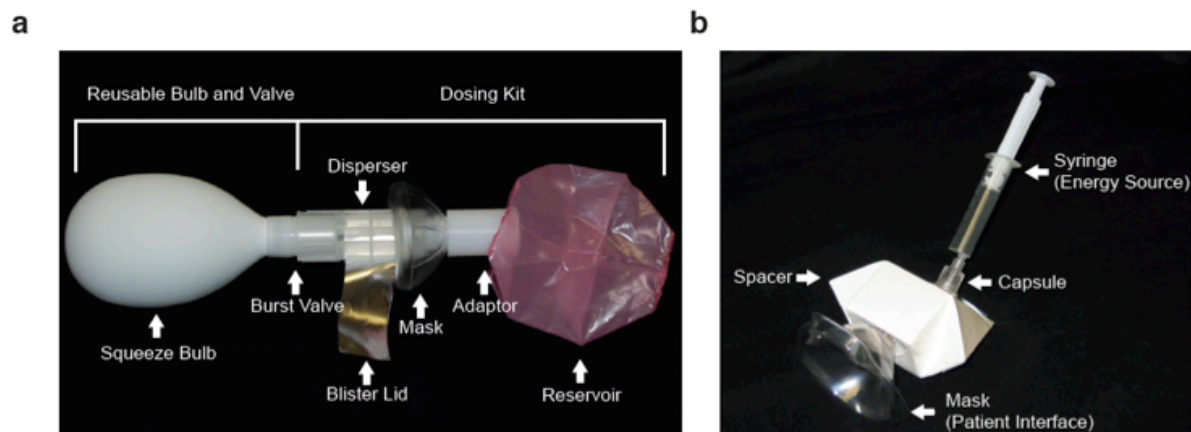
**Figure 2.** Measles Virus: Thin-section transmission electron micrograph (TEM) of a single virus particle (virion) of measles virus.<sup>16</sup>

criteria required for potential eradication: first, humans are the only pathogen reservoir; second, accurate diagnostic tests exist; and third, an effective, practical, and low cost intervention is available.<sup>5</sup> The World Health Organization (WHO) has set a measles elimination goal for the WHO Africa region by 2020.<sup>6</sup> Although global elimination of measles remains promising, recent outbreaks and a sudden rise in the number of measles cases in 2011 have reminded us of the burden measles can cause in both developed and developing countries alike. In fact, during the first 19 weeks of 2011, 118 cases of measles were reported in the USA, the highest number reported during this time period since 1996.<sup>7,9</sup>



**Figure 1.** Clinical symptoms of measles: Child with rash associated with measles (A), courtesy of the CDC/Barbara Rice. Measles rash in a rhesus monkey with wild-type MV strain infection on face (B) and arm (C).

**Figure 3.** Inhalers used to administer the single-dose dry powder live-attenuated measles vaccine (MVDP). a. Puffhaler (Puff), b. BD Solovent (Sol). These devices were used to ensure deposition of measles virus into the respiratory system.



### Biology and Pathogenesis

Measles virus is a member of the *Paramyxoviridae* family and *Morbillivirus* genus. It is a spherical, enveloped, non-segmented, single-stranded, negative-sense RNA virus that encodes a genome of about 16,000 nucleotides (Figure 2).<sup>1</sup> Viral entry depends on the interaction between the Hemagglutinin (MV-H) protein and the Fusion (MV-F) protein and receptor molecules on the host cell surface.<sup>9</sup> Much remains unknown about basic MV pathogenesis<sup>1</sup>; however, it is currently accepted that wild-type strains (naturally occurring strain of MV, also more virulent than the vaccine strain) of MV enter host immune cells via the CD150 (SLAM- signaling lymphocyte activation molecule) cellular receptor, while the vaccine strain uses either CD46 (present on all nucleated human cells) or CD150 for entry.<sup>1</sup> Nectin 4 (PVRL4), a tumor cell marker commonly found on lung, breast, and colon cancer cells, was recently identified as a receptor for wild-type MV infection of respiratory epithelial cells.<sup>10</sup> Studies using recombinant strains of MV that express green fluorescent protein as a reporter (eGFP-MV) for infection of well-differentiated polarized human respiratory epithelial cells and cell lines have suggested that MV “preferentially enters from the basolateral surface” and buds from the apical (the side facing lumen) surface.<sup>11</sup>

<sup>12</sup> However, a competing theory suggests

that MV can also enter from the apical surface and bud from the apical surface.<sup>13</sup> Despite much uncertainty concerning initial sites of viral replication, the respiratory epithelium is believed to be one of the target sites of initial MV infection before spreading systemically to other organs through infection of lymphoid cells.<sup>1</sup> Questions concerning the identification of the cells in the respiratory tract targeted during the initiation of MV infection, viral entry mechanisms, and the effects of viral replication in host cells remain unknown. However, by using rhesus monkeys as the animal model, we can study MV pathogenesis both *in vivo* and *in vitro*.<sup>14</sup>

### EFFORTS TO ELIMINATE MEASLES CASES GLOBALLY

Currently, medical practitioners admin-

ister the measles vaccine subcutaneously using a needle and syringe. Even with the remarkable progress that the measles vaccination has established globally, the ideal measles vaccine would be: inexpensive, safe, heat-stable, immunogenic

in neonates or young infants, and administered as a single dose without using a needle.<sup>2</sup> Recently, a successful respiratory dry powder vaccine against measles was developed and tested in rhesus monkeys by a team of researchers at the Johns Hopkins Bloomberg School of Public Health, along with a cohort of experts from multiple disciplines and health sectors including the CDC. Clinical trials will soon begin in India with hopes of making a

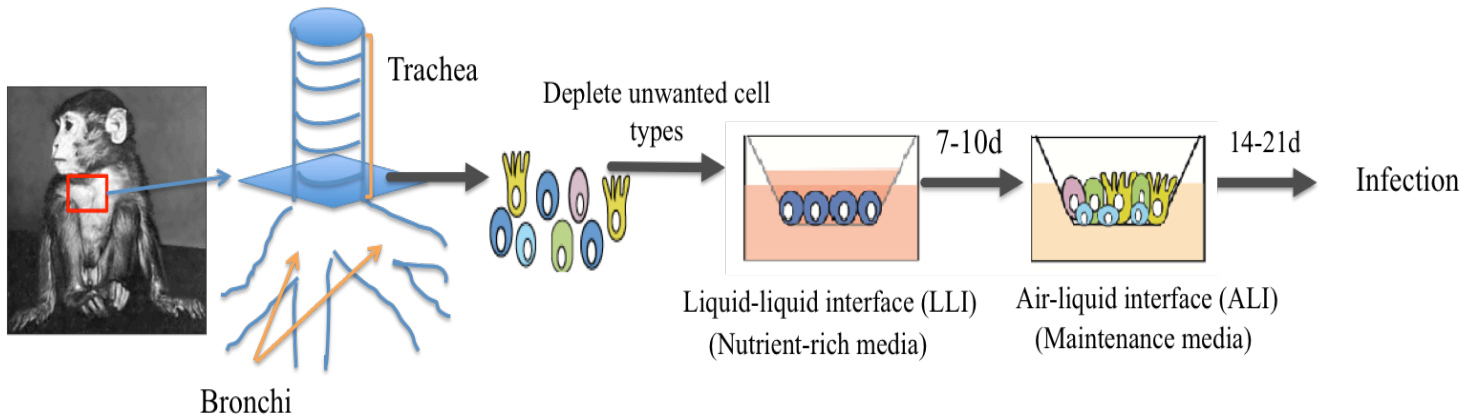
---

**High vaccine coverage (greater than 95%) is required to prevent transmission of measles within populations because of its infectious nature; in situations where less than 10% of individuals are susceptible, outbreaks are still possible.**

---

single dose dry powder live-attenuated measles vaccine (MVDP) available globally. Although much debate remains over the exact initial target site(s) of MV





**Figure 4.** Tracheal epithelial cell (TEC) culture system. TECs derived from rhesus monkeys are grown on special membrane inserts until cells differentiate into respiratory epithelial cell populations. Fully differentiated TECs required approximately 3 weeks and in the process transition from the LLI phase to the ALI phase and are subsequently infected.

infection, respiratory epithelial cells are believed to be among the first to be infected leading to increased interest in developing an intrapulmonary live-attenuated MV vaccine. The MVDP vaccine is a promising alternative to the current measles vaccine because it is heat-stable, can remain in powder form throughout the shipping and immunization process (eliminating the need for reconstitution into the liquid form), and does not require multiple doses to stimulate a protective immune response.<sup>15</sup> Different delivery routes and formulations of the vaccine were used to determine which method was more efficient in creating an immune response. MVDP was administered using either a PuffHaler (Puff) or BD Solovent (Sol) inhaler (Figure 3) and was created so the aerosol delivery occurred through a mask or a nasal route to ensure “deposition and replication of MV in the respiratory tract”.<sup>15</sup> These intrapulmonary delivery methods were compared to the common subcutaneous (s.c.) needle administration of the vaccine. To assess the effectiveness of the MVDP against other formulations and delivery routes of the MV vaccine, antibody titers (measles-specific IgG) were examined and determined that the induction of IgG was faster in monkeys who received the Puff-mask

and Sol-mask MVDP than in monkeys that received Puff-nasal MVDP or s.c. LAV.<sup>15</sup> Additional tests to determine the efficacy of the different delivery routes of the vaccine included challenging<sup>15</sup> the vaccinated monkeys with the wild-type MV to examine the level of protection for monkeys immunized via different routes. Protection was determined by the “presence or absence of rash” and levels of MV RNA were assessed using qRT-PCR.<sup>15</sup> Results from these tests showed that animals vaccinated with Puff-mask, Sol-mask, or Sol-nasal did not have detectable levels of infectious MV, MV RNA or MV-Nucleocapsid (N) protein—the most abundant MV protein.<sup>15</sup> These data show that respiratory delivery of MVDP was successful in protecting against wild-type infection and that MVDP is a promising single-dose inhalable vaccine that can induce protective immunity just as well as the current subcutaneous measles vaccine, bringing us closer to global control of measles.<sup>15</sup>

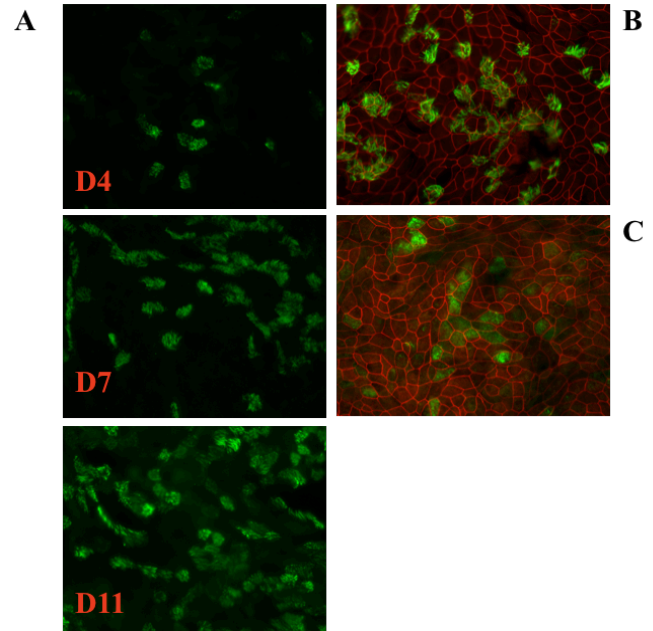
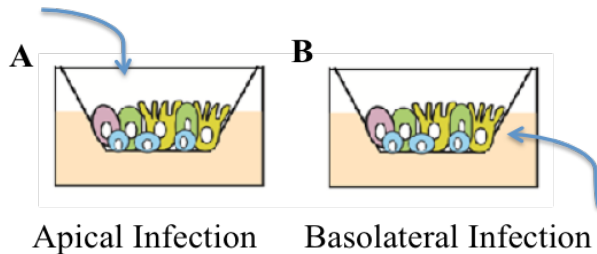
## UNDERSTANDING THE PATHOGENESIS OF MEASLES VIRUS IN VITRO

### Modeling MV infection in the respiratory tract using respiratory epithelial cells from Rhesus Monkeys

The goal of our study is to characterize an *in vitro* system using primary tracheal epithelial cells (TECs) from rhesus monkeys in order to understand the pathogenesis of MV infection by vaccine and wild-type strains including: direction of viral entry (apical or basolateral), susceptibility of cells depending on direction of infection, and characterization of TECs in the culture. Primary cells are more valuable than cell lines for these studies for multiple reasons. These include their ability to develop similar functions as their parent organ or tissue, their ability to differentiate *in vitro*, and their ability to mimic the *in vivo* conditions so organ systems can be isolated and studied *in vitro*. *In vivo*, the apical surface faces the lumen (cavity) of the trachea, and the basolateral surface interacts with the extracellular matrix and basement membrane where cell attachment occurs. Cells are grown on a thin membrane lining specialized transwell dishes (Figure 4). Before infection, cells have formed tight junctions and have dif-

**Figure 5 (right).** Differentiated TECs in culture. Panel **A** demonstrates an increase in the number of ciliated cells over time (D4, 7, 11) as indicated by the expression of *B-tubulin* in green. Similar observations for goblet cells as indicated by cell specific markers for *Muc5Ac* were identified (not shown here). An overlay of tight junctions as indicated by *zo-1* expression (in red) and ciliated cells (**B**) and goblet cells (**C**) in green define fully differentiated TECs. Images were taken after 3.5 weeks in ALI with 40x magnification.

**Figure 6 (below).** Viral infection of TECs. Cells are infected in the ALI phase as shown above at a multiplicity of infection (MOI) of 4.5. **A.** Apical infection of TECs is demonstrated. *In vivo*, this would be the surface facing the lumen of the trachea. **B.** Basolateral infection of TECs is demonstrated. This is the surface where cells attach to the basement membrane.



differentiated into characteristic respiratory epithelial cell populations such as ciliated and goblet (mucous secreting) cells (Figure 5). This process requires approximately 3 weeks, allowing cells to divide and proliferate in nutrient-rich media before transferring cells to a media lacking growth factors, which in turn allows cells to differentiate. During the proliferation phase, cells are grown in the liquid-liquid interface (LLI), which supplies cells with nutrients from both apical and basolateral surfaces. To facilitate differentiation, cells are switched to air-liquid interface (ALI) by removing media from the apical surface leaving media in the basolateral compartment. Following differentiation, TECs are infected with MV either apically or basolaterally and culture supernatant fluids are collected every 24hrs to monitor viral infection and growth over time (Figure 6). Cells on the culture dishes are frozen or fixed for immunofluorescent staining with antibodies against viral proteins, Western blot analysis for viral proteins, or RNA extraction for analysis by PCR. Results from this study will bring greater awareness to factors that will enable us to develop more effective vaccines that

target initial sites of viral infection and will aid in the campaign to eliminate measles deaths worldwide.

## CONCLUSIONS

### Looking ahead and assessing where we stand today

As a highly contagious childhood respiratory disease, studies have shown that differences in MV entry and infection depend on the MV strain and animal models used, which suggest that susceptibility to infection is host-specific. Therefore, it is important to use “relevant animal models systems or humans” to better understand MV pathogenesis.<sup>5</sup> In addition to the value of understanding the underlying mechanisms for MV infection and target sites of infection in the respiratory tract, these studies will improve our understanding of the biology behind MV infection in the respiratory tract and facilitate the development of alternative vaccine delivery methods that more effectively deliver vaccine to sites of infection in the respiratory tract and ultimately lead to a reduction in the number of measles-related deaths globally.

1. Griffin DE. Measles Virus. In: Knipe DM, Howley PM, eds. *Fields Virology*. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2007:1551-1585.
2. Moss WJ, Griffin DE. Global measles elimination. *Nature Reviews Microbiology*. 2006;4(12):900-908. doi:10.1038/nrmi-cro1550.
3. Madsen KM, Hviid A, Vestergaard M, et al. A population-based study of measles, mumps, and rubella vaccination and autism. *The New England Journal of Medicine*. 2002;347(19):1477-1482. doi:10.1056/NEJMoa021134.
4. DeStefano F. Vaccines and Autism: Evidence Does Not Support a Causal Association. *Clinical Pharmacology & Therapeutics*. 2007;82(6):756-759. doi:10.1038/sj.cpt.6100407.
5. Dowdle WR, Hopkins DR. *The eradication of infectious diseases: report of the Dahlem Workshop on the Eradication of Infectious Diseases*, Berlin, March 16-22, 1997. New York, NY: John Wiley and Sons; 1998.
6. World Health Organization Regional Committee for Africa. *Towards the elimination of measles in the African region by 2020. Report of the Regional Director*. 2009.
7. Centers for Disease Control and Prevention. *Measles---United States, January-May 20, 2011. Mobility Mortality Weekly Report*. 2011;60:666-668.
8. Moss WJ, Griffin DE. Measles. *The Lancet*. 2012;379(9811):153-164. doi:10.1016/S0140-6736(10)62352-5.
9. Ludlow M, Allen I, Schneider-Schaulies J.



*Photo courtesy of Komal Kumar*

- Systemic spread of measles virus: Overcoming the epithelial and endothelial barriers. *Thrombosis and Haemostasis*. 2009;102:1050-1056. doi:10.1160/TH09-03-0202.
10. Noyce RS, Bondre DG, Ha MN, et al. Tumor Cell Marker PVRL4 (Nectin 4) Is an Epithelial Cell Receptor for Measles Virus. *PLoS Pathog*. 2011;7(8):1-24. doi:10.1371/journal.ppat.1002240
  11. Sinn, PL, Williams G, Vongpunswad S, Cattaneo R, McCray PB. Measles Virus Preferentially Transduces the Basolateral Surface of Well-Differentiated Human Airway Epithelia. *Journal of Virology*. 2002;76(5):2403-2409. doi:10.1128/jvi.76.5.2403-2409.
  12. Leonard VHJ, Sinn PL, Hodge G, et al. Measles virus blind to its epithelial cell receptor remains virulent in rhesus monkeys but cannot cross the airway epithelium and is not shed. *Journal of Clinical Investigation*. 2008;118:2448-2458. doi:10.1172/JCI35454.
  13. Blau DM, Compans RW. Entry and Release of Measles Virus Are Polarized in Epithelial Cells. *Virology*. 1995;210(1):91-99. doi:10.1006/viro.1995.1320.
  14. Rima BK, Duprex WP. New concepts in measles virus replication: Getting in and out in vivo and modulating the host cell environment. *Virus Research*, 2011;162(1-2):47-62. doi:10.1016/j.virusres.2011.09.021.
  15. Lin WH, Griffin DE, Rota PA, et al. Successful Respiratory Immunization with Dry Powder Live-Attenuated Measles Virus Vaccine in Rhesus Macaques. *Proceedings of the National Academy of Sciences*. 2011;108(7):2987-2992. doi:10.1073/pnas.1017334108.
  16. Goldsmith, C. Centers for Disease Control and Prevention. <http://phil.cdc.gov/phil/details.asp?pid=8429>. Accessed March 19, 2012.

# The Implications of Environmental Tobacco Smoke on Lung Transplantation

## A Comparison between the United Kingdom and United States of America

---

### ABSTRACT

#### Background

Environmental tobacco smoke (ETS) is known to cause adverse health effects in non-smoking individuals. Occupational and residential exposure, especially in childhood, has been linked to increased risk of COPD, emphysema, and lung cancer. All three of these diseases necessitate a lung transplant in their severe stage.

#### Setting/Subjects

Non-smoking individuals exposed to ETS smoke in occupational and residential settings, all comparable US/UK data and policy in the realm of lung transplantation during the time period of 2001-2009.

#### Methods

A thorough literature and data search was performed on ten databases. Twenty eight sources were obtained and analyzed.

#### Results

Both nations' reports displayed increased risks of COPD, emphysema, and lung cancer in non-smoking individuals exposed to ETS. Overall lung transplantation data showed similar findings for

both nations in terms of average number of transplants performed as a percentage of candidates on the waiting list and the percentage of candidate deaths while waiting for a lung transplant. However, dividing the time interval in two parts revealed striking differences. While UK data remained wholly unchanged in both intervals, the US data showed significant improvement in median waiting time, mortality rates, and the number of transplants performed.

#### Conclusions

Both nations face a similar issue in terms of ETS exposure in non-smoking individuals. As a result, both the US and the UK must be aware that some citizens are involuntarily subjected to increased risk of severe lung diseases that necessitate lung transplantation. The implementation of the Lung Allocation Score in the US in 2005 is the most likely reason for the observed improvement in statistics. Both the US and the UK must continuously educate the public about the dangers of smoking and ETS, and strive to improve lung transplantation and its associated statistics.

### INTRODUCTION

As of 2008, the prevalence of cigarette smoking among legal citizens of the United States and the United Kingdom were 20.6% (46.0 million) and 21% ( $\approx$ 10.0 million) respectively.<sup>1,2</sup> Even though roughly four-fifths of these populations refrain from smoking, multiple reports and meta-analysis in both nations have shown a positive correlation between occupational and residential environmental tobacco smoke (ETS) levels and increases in rates of lung cancer, emphysema, and chronic obstructive pulmonary disease (COPD).<sup>3-10</sup> Even though smoking bans have been implemented in both the US and UK to help protect those individuals who do not smoke, ETS exposure is still a major cause of mortality in both nations; the number of deaths attributable to occupational and residential ETS exposure in the US and the UK are 30,000 to 60,000 and 3,300 to 11,000, respectively.<sup>4,7</sup>

In smoking and non-smoking individuals alike, severe cases of any of the aforementioned diseases pose a tremendous health problem. In both nations, lung cancer is the leading cause of all cancer deaths, and COPD/emphysema represent the fourth (US) and fifth (UK) leading cause of all deaths



*Photo courtesy of Komal Kumar*

nationwide<sup>11-14</sup>, the only option often left for continued survival is lung transplantation.<sup>15,16</sup> The difference in healthcare systems in these two nations thus warrants the question of overall effectiveness in dealing with lung transplantation. A comparative investigation of the operational atmosphere – i.e. waiting times, mortality rates, and operations performed<sup>17-27</sup> – is of extreme relevance to medical and public health professionals alike.

## **METHODS**

A literature search was performed on ten main databases (PubMed, Google Scholar, World Health Organization, Organ Procurement and Transplantation Network, Organ Donation and Transplantation Directorate, United Network for Organ Sharing, American Cancer Society, Cancer Research UK, Office for National Statistics, and U.S. Census Bureau) for articles written from 1988-present. The first two databases were chosen in order to garner overall information for both nations, whereas the latter eight were chosen because of their national specificity. The time period was selected in order to provide at least twenty years of research and data. The keywords utilized contained combinations of the following terms: environmental tobacco smoke, United States, United Kingdom, tobacco smoke pollution, emphysema, chronic obstructive pulmonary disease/COPD,

median waiting time, death rates, lung cancer, lung transplantation, total population, smoking rates, and prevalence. The OPTN national data report tool was used to acquire US lung transplantation data. The selection criterion for this data was lung transplant by state.

Articles involving multiple nations were excluded from the search results except in instances in which independent statistical data for the US or the UK could be obtained\*. When applicable, similar articles recommended by a given database were reviewed. All ETS articles were restricted to those involving nonsmokers only, or those in which smoking history was controlled for in the data. All articles chosen were read thoroughly, and pertinent references contained in a given article were examined for any further information. Comparative statistical analysis was limited to data that was available for both nations in the same years.

## **RESULTS**

Twenty eight sources were obtained from the database search. Fourteen of these sources were related to ETS, while the remaining fourteen involved lung transplantation. UK lung transplantation data was acquired through the annual Transplant Activity publication by the NHS Blood and Transplant division. US transplantation data was obtained from two sources - the data reporting system

provided by the Organ Procurement and Transplant Network website and the annual report published by the OPTN/Scientific Registry of Transplant Recipients.

## **ETS EXPOSURE**

### **US Studies**

Individual ETS exposure was evaluated on three dimensions. In a large multiethnic cohort, adult nonsmokers aged 45-84 were asked to report childhood ETS exposure based on the overall number of parental and regular household smokers. Qualitative CT scans revealed that adult nonsmokers who reported childhood ETS exposure experienced greater degrees of diffuse emphysema.<sup>3</sup> A multinational meta-analysis observed ETS exposure among never-smoking women and their husbands. The study concluded that never-smoking women exposed to spousal ETS had a 15% greater risk of lung cancer when compared with never-smoking women not exposed to spousal ETS.<sup>6</sup> The final study chosen involved an examination of the association between lifetime ETS exposure and the risk of developing COPD in 2,113 U.S. adults aged 55-75. Higher cumulative lifetime residential and occupational ETS exposure correlated with a greater risk of COPD

\* There is a multi-national meta-analysis (Ref: 6) included in this study that clearly differentiates North American results. While it does contain one Canadian study, the decision not to exclude it was made because an overwhelming majority of the data for the North American figures was acquired through US studies.

**Table 1: Death rates attributed to occupational and residential ETS exposure in UK households**

	Residential Exposure		Occupational Exposure
	Aged 20-64	Aged 65+	All workforce exposed at work
<b>Attributed Deaths</b>			
Lung Cancer	594	778	160
Overall	2726	7959	617
<b>Projected Deaths*</b>			
Overall	1600	4300	204

Source: Ref (4)

\*Calculated with the lowest statistically defensible estimates of the risks associated with passive smoking

**Table 2: Median waiting time until lung transplant; US/UK, 2001-2009**

Year	US Waiting Time (days)	UK Waiting Time (days)
2001-2002	1224	N/A
2002-2003	1057	N/A
2003-2004	924	N/A
2004-2005	792	N/A
2005-2006	200	N/A
2006-2007	134	--
2007-2008	142	519
2008-2009	148	--

Source: Ref (26, 27)

among these elderly individuals.<sup>10</sup>

### UK Studies

Studies performed in the UK reported similar findings in relation to COPD, lung cancer risk, and ETS. Studies estimated that passive smoking increased the risk of COPD in adults by 25%, and the relative risk of lung cancer in adult non-smokers passively exposed to ETS at home was 1.24 compared to non-smokers not exposed at home.<sup>5,8</sup> The prevalence of passive smoking in UK households was found to be 37% among adults of working age.<sup>4</sup>

Occupational exposure data estimated that the risk of lung cancer was increased by 20-30% among non-smoking individuals who worked with smoking co-workers.<sup>7</sup> Nationwide data approximated that passive smoking at work was likely to be responsible for more than two employee deaths per working day.<sup>4</sup> Studies found that while roughly half of all employees reported working in smoke free workplaces, 36% reported

working in places with designated smoking areas, and 9% reported working with no restrictions at all.<sup>9</sup> Estimated death rates due to occupational and residential ETS exposure are displayed in Table 1.

### Lung Transplantation<sup>\*17-26</sup>

Upon review of the literature on lung transplantation in both nations, the time period for comparative statistical analysis was determined to be 2001-2009. The average number of patients on the US and UK lung transplant lists throughout this time interval was found to be 5104.3 and 441.1, respectively. The average number of transplants performed as a percentage of patients on the waiting list was found to be 25.3% (1264.4) for the US and 27.9% (122.8) for the UK.

Due to the large number of seriously ill patients on both nations' transplant lists, median waiting times until lung transplant and total candidate deaths while waiting for a lung transplant were also analyzed. In 2006-2009, UK lung transplant candidates had to wait an

average of 519 days to receive a transplant,<sup>27</sup> whereas similar candidates in the US had to wait an average of 141.3 days (Table 2). In 2001-2009, an average of 417.9 US patients died per year while waiting for a lung transplant, correlating to 8.1% of patients waiting. In the UK, an average of 47.8 patients died per year, correlating to 10.7% of patients waiting.

## DISCUSSION

### Explaining Inequalities - LAS

While the US private party system drastically differs from the UK NHS system, lung transplantation was approached in fairly similar ways by both nations in 2001-2004. Both systems were based on a "first come, first serve" methodology that assigned patients a spot on the list, while also considering blood type compatibility and donor availability.

The fact that the US data improved in the latter half of this review is not indicative of failure on behalf of the UK healthcare system; overall, the UK has remained wholly consistent throughout the eight years reviewed. What it is indicative of is the success of a new criterion in lung transplantation – the lung allocation score (LAS). The LAS was designed to represent "an estimate of the severity of each candidate's illness and his or her chance of success following a lung transplant...[and] to more effectively use the limited number of available donor lungs as well as reduce the number of deaths among people waiting for a transplant."<sup>28</sup>

The US private party healthcare system has made a crucial first step in addressing lung transplantation issues with the implementation of the LAS. By doing so, it has provided the socialized system of the UK with one possible way of tackling the observed inequalities.

## LIMITATIONS

While overall lung transplantation figures were addressed in this article, the data used to compile each nation's statistics did not differentiate between smoker and non-smoker transplants in both the US and the UK. Furthermore, data regarding the number of US individuals who needed a lung transplant but could not afford the procedure was not included in the obtained statistics, and was therefore not used in the results.

## CONCLUSION

This article has shown that ETS exposure in the US and UK increases the risk of non-smoking individuals to develop diseases that necessitate a lung transplant. Moreover, by compiling lung transplantation data from 2001-2009 for both nations, the inequalities in the US and UK systems have become apparent. With death rates from, and overall rates of, COPD, emphysema, and lung cancer increasing with prolonged ETS exposure in non-smoking individuals in both nations, the need for an effective lung transplantation system for both of these healthcare systems is all-the-more crucial. Because of the involuntary nature of ETS exposure, and the health outcomes that can result, both countries need to continuously address this issue from the medical and public health perspective.

Medical professions can utilize the data presented in this article to track patients with known ETS exposure and keep them constantly informed about the associated risks. The direct and indirect health consequences associated with tobacco smoke must be used by doctors to encourage their patients to stop smoking. Smoking bans and other anti-smoking policies must be implemented on the local and national levels, especially in the occupational setting, in order to protect

those individuals who choose not to smoke. Public health professionals must continuously work to educate individuals about the hazards of smoking; this education can be bolstered by incorporating the data provided in this article.

1. Center for Disease Control and Prevention. Cigarette smoking among adults and trends in smoking cessation—United States, 2008. *Morbidity and Mortality Weekly Report*. 2009;58(44):1227-1232.
2. Action on Smoking and Health. *Smoking Statistics: Who Smokes and How Much*. <http://ash.org>. 2010. Accessed November 29, 2010.
3. Lovasi GS, Roux AVD, Hoffman EA, et al. Association of environmental tobacco smoke exposure in childhood with early emphysema in adulthood among nonsmokers. *American Journal of Epidemiology*, 2009;171(1):54-62.
4. Konrad, J. Estimate of deaths attributable to passive smoking among UK adults: database analysis. *BMJ*. 2005;330:812.
5. Lung & Asthma Information Agency. *Environmental tobacco smoke*. Rep. no. 99/3. London: LAIA; 1999.
6. Richard T, Najafi F, Dobson A. Meta-analysis of studies of passive smoking and lung cancer: effects of study type and continent. *International Journal of Epidemiology*. 2007;36:1048-059.
7. Allwright S, McLaughlin JP, Murphy D, et al. Health and Safety Authority. Office of Tobacco Control, Ireland. Report on the health effects of environmental tobacco smoke (ETS) in the workplace. 2002.
8. Law MR, and Hackshaw AK. *Environmental tobacco smoke*. *British Medical Bulletin*. 1996;52(1):22-34.
9. London. Office for National Statistics. *Smoking related behaviour and attitudes*. 2003. Accessed November 20, 2010.
10. Eisner MD, Balmes J, Katz PK, Trupin L, Yelin EH, Blanc PD. Lifetime environmental tobacco smoke exposure and the risk of chronic obstructive pulmonary disease. *Environmental Health: A Global Access Science Source* 7th ser. 4. 2005. Accessed November 18, 2010.
11. Cancer Research UK. *Lung cancer - UK mortality statistics*. Cancer Research UK. 2010. Accessed November 17, 2010.
12. American Cancer Society. *Cancer facts & figures 2010*. Atlanta: American Cancer Society. 2010. Accessed November 23, 2010.
13. National Heart Lung and Blood Institute. *COPD. Diseases and Conditions Index*. Department of Health & Human Services, National Institutes of Health. Accessed November 24, 2010.
14. National Statistics. *Health Statistics Quarterly*. Publication no. 30. Office for National Statistics. 2006. Accessed November 19, 2010.
15. NHS. *Lung Transplant. NHS choices*. NHS. 2010. Accessed November 21, 2010.
16. Transplant Living. *Lung. Organ facts*. Transplant Living. 2010. Accessed November 22, 2010.
17. UK. National Health Service. *Statistics and audit directorate. United Kingdom Transplant Activity 2001*. NHS Blood and Transplant. 2002. Accessed November 14, 2010.
18. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2002-2003*. NHS Blood and Transplant. 2003. Accessed November 14, 2010.
19. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2003-2004*. NHS Blood and Transplant. 2004. Accessed November 14, 2010.
20. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2004-2005*. NHS Blood and Transplant. 2005. Accessed November 14, 2010.
21. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2005-2006*. NHS Blood and Transplant. 2006. Accessed November 14, 2010.
22. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2006-2007*. NHS Blood and Transplant. 2007. Accessed November 14, 2010.
23. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2007-2008*. NHS Blood and Transplant. 2008. Accessed November 14, 2010.
24. UK. National Health Service. *Statistics and audit directorate. Transplant Activity in the UK 2008-2009*. NHS Blood and Transplant. 2009. Accessed November 14, 2010.
25. Organ Procurement and Transplantation Network. *OPTN national data report system. National Data. OPTN, HHS, HRSA*. <http://optn.transplant.hrsa.gov/latestData/step2.asp>. Accessed November 12, 2010.
26. OPTN/SRTR 2009 annual report - data tables 12.2, 12.3. Rep. Organ Procurement and Transplantation Network, Scientific Registry of Transplant Recipients. [http://optn.transplant.hrsa.gov/ar2009/data\\_tables\\_section12.htm](http://optn.transplant.hrsa.gov/ar2009/data_tables_section12.htm). Accessed November 22, 2010.
27. NHSBT. *Waiting time to transplant*. Organ Donation. Organ Donation. Accessed November 26, 2010.
28. United Network for Organ Sharing. *Questions & answers for transplant candidates about lung allocation policy*. Richmond, VA: UNOS. Accessed November 28, 2010.



# PRINCIPLES





# & POLICIES

*Photo courtesy of Sandhira Wijayaratne*

# When It Comes to Sugar, I'll Go with the Danish

When one says “Denmark,” many images may come to mind: tall, stylish blondes, Legos, Vikings, and, of course, pastries. However, a new topic can be added to that list. Recently, the small Scandinavian nation of 5.5 million people made international headlines by enacting a so-called “fat tax.” The newly implemented tax adds 16 kroner (just under US \$3) per solid kilo of saturated fat. The tax applies to all foods with a saturated fat content of over 2.3%, so it is not limited to classical “junk food” like cookies and sweets, but also includes foods that are consumed daily, like butter and cheese. This

tax is limited to foods with saturated fats, so foods that are high in sugar or unsaturated fat are still available at the same price. Trans fats have been banned in Denmark since 2003.

In general, the tax has been well received by Danish citizens. Further, the measure was passed with widespread support across political parties and from members of parliament. A Danish man who was interviewed by the BBC said he approved the tax, because like a tax on tobacco or alcohol “it’s a way to show people that [that] is not a good way to live.” It has also been suggested that the

new tax is a way to help pay for potential health expenditures in the future. People who lead unhealthy lives tend to have greater health problems and require more health care and medical attention. One aspect of an unhealthy life style is poor eating habits, including foods that are high in not only sugar and calories, but also saturated fats. Because Denmark’s government-run healthcare sys-

---

**One aspect of an unhealthy life style is poor eating habits, including foods that are high in not only sugar and calories, but also saturated fats.**

---

tem is financed by tax money, the additional revenue from this new tax would most likely come from people who have less healthy diets and tend to buy more foods that are high in saturated fat. It is these people who may ultimately utilize more health care service. Some believe that it will all even out in the end.

Many in the public health world are applauding the new tax as an effective way to limit the consumption of unhealthy foods and to combat obesity, an epidemic that is quickly spreading across the globe. Although it will take time to determine the effectiveness of the tax, the Danes are optimistic about its positive health implications.

Denmark may have made headlines with their recent tax, but attempts to tax unhealthy foods are not limited to

Europe. In late 2008, as part of the fiscal year 2009 budget, New York State Governor James Patterson introduced a bill to tax non-diet soda. The first bill he introduced would have added a 15% tax to non-diet soda, which would be paid by consumers when they purchased the beverages. Immediately the proposed tax was met with resistance. Due to the pressures of the upcoming gubernatorial race, Patterson allowed the issue to drop. The following year a new soda tax was introduced that would add a tax of 1 cent per ounce for all non-diet sodas. In addition to the support from public health professionals, the move was strongly supported by New York City mayor and avid public health advocate Michael Bloomberg, as well as by President Obama. However, this specified tax also generated tremendous resistance and was ultimately defeated in the State Assembly.

Statistics show that a soda tax would both increase tax revenue and provide much needed funding for state and city budgets. This could have a tremendous impact on obesity and subsequently chronic disease rates. So if such a tax could be so beneficial to the health of the population and the strength of the government’s budget, why has it not yet been enacted? The simple answer: the beverage lobby.

Opponents of the proposed tax argue that it unfairly singles out soda as a cause for obesity, and they have a point. Soda isn’t the only culprit when it comes to obesity, but it is a prominent one. Unlike other high calorie foods, such as fast food

hamburgers or processed snack foods, the calories an individual consumes when he or she drinks a soda are empty calories – there is absolutely no nutritional value associated with them. And although soda is the only food product legislatively under attack now, it is by no means the only one in the history of the public health crusade against obesity.

This past spring I studied abroad in Copenhagen and took part in the public health program at the Danish Institute of Study Abroad. Inevitably, the topic of obesity came up. As a class of American public health students we were all too familiar with the obesity epidemic in our home country. What shocked us was our professor's genuine concern over the growing obesity rates in Denmark. Denmark has an obesity rate of 9%. On the other hand, Colorado was the last state to have an obesity rate in the single digits – and that was ten years ago.

So why is it that a country with an obesity rate roughly a quarter of what it is in the US so openly embraces the attempt to curb obesity when we are literally dying from the problem and can't seem to stop it? New York Times columnist Mark Bittman has come up with a few suggestions as to why the Danes have put up minimal resistance to a tax that results in higher food prices. Like most governments, the Danish government was looking for another way to increase revenue and more comfortably balance its budget. Danes are also used to paying high tax rates (roughly 46% to 48%) so the extra tax on saturated fats is only a subtle increase, and only for those who choose to purchase certain foods. And lastly, Bittman points out that Danes are accustomed to “social engineering,” that is listening to the government when it says what is and what is not acceptable.

It is no secret that the federal and state governments in the US need to

increase revenue, but it is equally well known that a large portion of the US populace is unhappy with the government and would not be supportive of a new tax any time soon. What does this mean for the US? Has Denmark set a good example for other European countries, but not the US? The New York soda tax did not pass, but that does not mean New Yorkers are not concerned about their health. Only slightly before the failed tax, a new law was enacted in New York City that required chain restaurants to post the number of calories in each menu item. Mayor Bloomberg also successfully ushered through a law that banned the use of trans fats in the city. Like the soda tax, these measures were aimed at reducing obesity and enabling New Yorkers to make better food decisions. These laws involved the government stepping in and, in a sense, telling the people what is good and bad by showing them just how unhealthy some of their food options are. Why did those laws pass while the soda tax could not catch a break? Perhaps it was because the ban on trans fat was passive; certain foods became a bit healthier without people having to make any dietary changes themselves. Likewise, the calorie law going into effect did not necessarily require people to change their eating habits, although it did help facilitate making better informed food choices.

The negative health effects of eating highly calorie and fatty foods are now fairly well known, but despite that knowledge there is little noticeable difference in the eating habits of Americans. It may be difficult for most people to change their habits on their own. Perhaps the strong resistance to the soda tax is a sign of just how effective it would be if it passed. People do not want to pay more to consume unhealthy food. If they had to, then it might finally cause them to rethink what they are eating. As an

---

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

---

avid supporter of the soda tax and other similar measures, I think it is time that we in the US take a cue from our Scandinavian friends and enact healthy food legislation. People may argue that this would allow big government too much power to interfere with our lives, but the government is not trying to run your life. It is trying to save it.

1. Allman, Tim. 'Fatty food tax' introduced in Denmark. British Broadcasting Company. October 1, 2011. <http://www.bbc.co.uk>. Accessed October 18, 2011.
2. Bittman, Mark. How about a little Danish? The New York Times. October 4, 2011. <http://www.nytimes.com>. Accessed October 20, 2011.
3. Chan, Sewell. A tax on many soft drinks sets off a spirited debate. The New York Times. December 16, 2008. <http://www.nytimes.com>. Accessed October 18, 2011.
4. DeBlasio, Bill. Pass the soda tax. The New York Observer. June 22, 2010. <http://www.observer.com>. Accessed October 18, 2011.
5. Rosenbloom, Stephanie. Calorie data to be posted at most chains. The New York Times. March 23, 2010. <http://www.nytimes.com>. Accessed October 18, 2011.
6. Sulzberger, A.G. Bloomberg says a soda tax 'makes sense.' The New York Times. March 7, 2010. <http://www.nytimes.com>. Accessed October 20, 2011.

# A Challenging Road Ahead for Comparative Effectiveness Research

---

## MY PATH TO COMPARATIVE EFFECTIVENESS RESEARCH

According to the Institute of Medicine (IOM), currently about half of treatments are delivered without clear evidence of effectiveness, which “contributes to great variability in managing clinical problems, with costs and outcomes differing markedly across the country.”<sup>1</sup> I was fortunate enough to enter the field of public health and health policy at a time when government interest in addressing this issue was growing. However, if you had asked me at the beginning of my undergraduate degree what the field of public health was, I am not confident I would have been able to give you an answer. In fact, my interest in the field of public health emerged from my studies of molecular biology. Although the biological sciences were fascinating, I found myself more concerned with how basic science research was translated and used to improve patient outcomes. As a result of my growing interest in this topic, I decided to enroll in the Masters of Health Sciences Program at the Bloomberg School of Public Health in 2008. During my time as a Master’s student, I learned more about the US healthcare system and I became aware of the lack of evidence demonstrating which of the many available diagnostics, drugs, and devices used to

care for patients were best. In addition, I began working for a small, non-profit organization in Baltimore called the Center for Medical Technology Policy (CMTP).<sup>2</sup> The mission of CMTP is to bring different stakeholders including patients, doctors, insurance providers, manufacturers, researchers, and relevant government representatives together

---

**However logical it may seem that the more evidence to inform clinical and health policy decisions the better, providing federal support for this effort was nevertheless controversial.**

---

to discuss future research and design research studies to provide the evidence needed to make important clinical and health policy decisions. It was as a result of my work at CMTP that my interest

in comparative effectiveness research (CER) really developed.

## AN INCREASING DEMAND FOR MORE EVIDENCE OF EFFECTIVENESS OF DRUGS, DEVICES, AND DIAGNOSTICS

Since the time I started at CMTP, the Federal Government has made a concerted effort to support CER. First, by investing \$1.1 billion through the American Recovery and Reinvestment Act (ARRA) of 2009 to fund CER<sup>3</sup> and later by making a more prolonged investment through the Patient Protection and Affordable Care Act (PPACA) of 2010. PPACA renamed CER patient centered outcomes research and established the Patient Centered Outcomes Research Institute (PCORI).<sup>4</sup> The Federal Coordinating Council, established following the passage of ARRA, defined CER as follows: “Comparative effectiveness research is the conduct and synthesis of research comparing the benefits and harms of different interventions and strategies to prevent, diagnose, treat and monitor health conditions in ‘real world’ settings. The purpose of this research is to improve health outcomes by developing and disseminating evidence-based information to patients, clinicians, and other decision-makers, responding to their expressed needs, about which interventions are most effective for which patients under specific circumstances.”<sup>8</sup>

However logical it may seem that the more evidence to inform clinical and health policy decisions the better, providing federal support for this effort was nevertheless controversial. Although both the Democratic and Republican party platforms supported CER during the last election, once Barack Obama took office, the Republican party and various interest groups touted CER as a means of rationing health care and the term “death panel,” which refers to the government’s ability to decide if the public will have access to expensive therapies, began to gain headway.<sup>5,6</sup> These claims turned attention away from the positive goal of generating evidence to better inform decision-making, to sinister claims that such evidence would be used to deny coverage for expensive medical treatments and to place limits on the autonomous choice of patients and physicians.<sup>5</sup> There were also claims that a focus on CER could hinder biomedical innovation. These claims, among others, led Democrats to make a number of revisions to the proposed legislation.<sup>5,6</sup> For instance, in response to fears that the underlying objective of CER was to limit access, the legislation now explicitly states that PCORI cannot use cost per quality-adjusted life year “as a threshold to establish what type of healthcare is cost effective or recommended.”<sup>4</sup>

Nevertheless, the passing of PPACA and the establishment of PCORI against these criticisms demonstrated that, at least for now, there will be a continued investment in CER. However, there is still much to be done to ensure that this investment made in CER accomplishes the objective of helping “people make informed health care decisions and [allowing] their voice to be heard in assessing the value of health care options.”<sup>7</sup>



*Photo courtesy of Sandhira Wijayaratne*

## A CHALLENGING ROAD AHEAD

In addition to the need to generate public trust in the CER enterprise<sup>6</sup> and ensure that the “death panel” anecdotes are put to rest, PCORI and others engaged in the conduct of CER must also set out fair criteria for prioritizing research questions and must engage appropriate stakeholders to ensure that the evidence that is produced is responsive to the needs of stakeholders. Moreover, PCORI must develop methodological guidance on the conduct of CER, must ensure that there is sufficient infrastructure and ethical

guidance to support CER, and must ensure that the research is translated and used to provide high value patient care. It is safe to say that the road ahead will be challenging, especially with the close oversight of those who criticized the effort from the start.

Fortunately, some of this work has already begun. The PCORI Board of Governors has been established as well as a Methodology Committee charged with developing “guidance about the appropriate use of methods in such research, methodological standards, as well as establishing priorities to address gaps in

research methods or their application.”<sup>9</sup> By May of 2012, PCORI must produce a report that describes different methods for conducting CER. An important component of this will be to develop methods for more closely integrating clinical research with clinical practice, creating what the Institute of Medicine (IOM) has termed a “Learning Health Care System,” so that research can be implemented and conducted more efficiently and at a lower cost. Furthermore, as part of this report, PCORI must also describe methods that can be used to prioritize different research questions.

To begin this process, PCORI issued a Request for Proposal for white papers that explore different methods that can be used to prioritize research questions. PCORI will use these reports to devise a method by which future research priorities will be set.<sup>10</sup> The importance of this step should not be overlooked. The way in which priorities are set and the criteria used to select those priorities reflect important value judgments. Establishing these criteria will require PCORI to consider significant ethical questions. For instance, PCORI will need to decide if it should give priority to research questions that have the potential to reduce disparities or to research questions that target the most prevalent medical conditions. Nevertheless, numerous groups, including the IOM, the RAND Corporation, and CMTP, among others have been working on developing methods for priority setting.

In terms of infrastructure, \$375 million of the \$1.1 billion invested in CER through ARRA was used to support infrastructure development.<sup>11</sup> In addition, research networks such as the Agency for Health Care Research and Quality’s Practice-Based Research Network and the DEcIDE (Developing Evidence to Inform Decisions about Effectiveness) centers can be leveraged for CER. Nev-

ertheless, ensuring that CER efforts are coordinated will be critical. In addition, there is a need for further understanding of the ethical implications of the increasing integration of clinical research with practice. Part of the problem with increasing integration is that the lines between what should count as research and what is just a normal part of clinical practice become blurred. The Johns Hopkins Berman Institute of Bioethics is currently undertaking important work to begin to think through these issues. The Institute was awarded a grant from the National Institutes of Health, with some of the ARRA money earmarked to support CER, to examine the boundaries between research and treatment, including what type of oversight should exist for activities that integrate both clinical care and research components. In addition to assisting in this effort, the research I am undertaking in the bioethics PhD program builds on the work being done by the Institute and explores whether traditional means of informed consent should always be required for randomized CER trials that are closely integrated with clinical practice and that compare different approved and widely available drugs.

A final piece to the CER puzzle will be figuring out the best practices for translating findings from CER into ultimately improving outcomes for patients and ensuring that money spent on healthcare is used to provide high value services. If the evidence generated is not used, some may question whether the money currently being spent to support this endeavor might be better used elsewhere. Part of this will require stakeholders to consider how to place a value on health care services. Unfortunately, health care resources are not unlimited, making hard choices inevitable. Although those who tout CER as a step towards “death panels” would like us to

believe that the process we have right now is better, a system that rations based on ability to pay instead of based on a fair process of selecting high value medical technologies is both unjust and inhumane. Public and private insurers are forced to make tough decisions every day. This effort in CER will hopefully provide high quality evidence of what works best and for which patients to better inform these tough decisions.

- 
1. Committee on Comparative Effectiveness Research Prioritization, Institute of Medicine. Initial national priorities for comparative effectiveness research. Washington D.C.; National Academies Press; June, 2009.
  2. The Center for Medical Technology Policy. About CMTP. Available at: <http://cmtmpnet.org/about-cmtmp>. Accessed October 15, 2011.
  3. Department of Health and Human Services. Comparative Effectiveness Research Funding. Available at: <http://www.hhs.gov/recovery/programs/cer/index.html>. Accessed October 15, 2011.
  4. Patient Protection and Affordable Care Act of 2010. PL 111-148, sec. 1182.
  5. Igelhart JK. The Political Fight Over Comparative Effectiveness Research. *Health Affairs* 2010; 29(10): 1757-1760.
  6. Patel K. Health Reform’s Tortuous Route to the Patient-Centered Outcomes Research Institute. *Health Affairs* 2010; 29(10):1777-1782.
  7. PCORI. About Us. Available at: <http://www.pcori.org/patient-centered-outcomes-research/>. Accessed October 15, 2011.
  8. Federal Coordinating Council for Comparative Effectiveness Research. Report to the President and to Congress. Washington D.C.: Department of Health and Human Services; July 30, 2009.
  9. PCORI. Committee Charters. Available at: <http://www.pcori.org/about/leadership/pcori-board-committees/committee-charters/>. Accessed October 15, 2011.
  10. Patient-Centered Outcomes Research Institute. Request for Proposal – White Paper. Available at: <http://www.pcori.org.php5-24.dfw1-2.websitetestlink.com/assets/PCORI-Research-Priorities-White-Papers-RFP.pdf>. Accessed October 15, 2011.
  11. Benner JS, Morrison MR, Karnes EK, Kocot SL, McClellan M. An Evaluation of Recent Federal Spending on Comparative Effectiveness Research. *Health Affairs* 29(10): 1768-1776.

# The Development of the Private Healthcare Industry in China and the Implications of Government Reform

---

## INTRODUCTION

In 1951 the Chinese central government released a key policy titled “Temporary Regulations for Hospitals and Clinics.” While this policy contained various regulations and laws concerning the management of hospitals across the country, there was one key regulation that stood out, namely permission from the central government to operate private healthcare institutions. This was further supported in 1994 with the release of another policy report called “Healthcare Management Regulations,” which allowed government support for non-state operated and managed healthcare facilities.

However, these policies were implemented with varying degrees of success. At the time, most healthcare workers did not move towards a privatized healthcare institution, preferring instead to remain under the employment of public, state-run hospitals and clinics. This was due to varying factors, such as job security provided by the government, prestige, and trust from the people. Furthermore, state-run hospitals were run with the resources of the Ministry of Health, allowing greater support than offered to private hospitals.

As such, in 1949, the healthcare

industry in China consisted almost entirely of state-owned facilities. There were only 20-30 private facilities, mainly small rural clinics run by retired physicians, out of more than 100,000 facilities in the country. This trend continued up until the last 20 years following the reforms enacted under Premier Deng Xiaoping who had reversed the policies of his predecessor Mao Zedong, allowing trade between China and the West, triggering an era of explosive economic growth as well as a shift in the healthcare industry.

Following the rapid growth of the economy, private hospitals and clinics became an integral part of the Ministry of Health’s national healthcare system, acting as a supplement to the country’s overwhelmed public hospitals. Under this focus, the Ministry of Health established regulations on ownership of healthcare facilities ranging from full state-ownership to public-private ownership. Under these regulations, up to 70% of a hospital could be owned by private investors, while the government would control the remaining 30%.

## DEVELOPMENT

The establishment, development, modification, and elevation of the private

healthcare industry that led to today’s standards is a fortunate occurrence that also holds many implications and opportunities for its stakeholders, the health of the Chinese people, and the government’s vision of a “harmonious society.” However, it has only been in the last ten years that there has been a large growth in the number of private healthcare facilities.

In 1998, the private healthcare industry was still at a small scale. Estimates put the total number of private facilities at only 21 during that time. In 2002, a national survey showed improvement, finding that there were 1477 private hospitals. There was further growth in 2004, when out of China’s total 17844 hospitals, 1792 of them were privately owned and operated, accounting for around 10% of the national total. Finally, in 2010, the private sector held a well-established position in the healthcare industry. A 2010 Ministry of Health survey found that private hospitals consisted of 24% of the national total of 20,918 hospitals. They also consisted of 11% of the total beds in the country.

The lack of a technically qualified workforce, poor management, and a poor culture still caused countless barriers and obstacles despite the growth of the private healthcare industry. Private hos-

pitals may have grown in numbers, but they still lacked public counterparts.

Even with these problems, private hospitals were considered superior in certain facets of healthcare. First, state-owned hospitals were renowned for bureaucracy, causing a marked difference between state and private hospitals, which could be more efficient and flexible in terms of management. Private hospitals were also able to take their own direction and excel in specific specialties. The freedom of private management also ensured that private hospitals could focus on many different areas of pa-

growth. In particular there is a growing emphasis on evidence-based medicine and focus on rigorous science.

There have been six main trends in the management of private hospitals as a result of their development. Community-based medical service centers, such as clinics, were the first and earliest form of private healthcare facilities. These not only were able to take care of most needs but also acted as primary care providers. Next there came the division of state ownership and management, where the government would retain sole ownership of a hospital but allow private companies

## GOVERNMENT POLICIES REGARDING THE DEVELOPMENT OF PRIVATE HOSPITALS

In April 2009, the central government released a new healthcare reform policy. In the reforms, several policies were stated to aid and improve the development of private hospitals in China. One such policy was directed at gradually reforming public hospitals and decreasing the proportion of public hospitals, while focusing both public and private hospitals on the common goal of high quality, patient-centered care. This was done to control costs related to hospital operations for the government.

Another policy was to allow the formation of for-profit medical institutions and to treat private hospitals on an equal level with public hospitals in order to promote the principle of mutual development. This policy would not only increase the diversification of medical facilities and specialties but also promote the establishment of private non-profit hospitals.

Furthermore, under aspects such as healthcare reimbursements, insurance, research, and medical education, private hospital would receive the same attention and conditions of public hospitals. Both would also be subject to the same regulations and standards as well.

These policies were implemented in order to increase the range and accessibility of medical organizations available to the Chinese population. Furthermore, it demonstrates the further liberalization of the government towards healthcare policies, allowing market forces to set the price in the hope of increasing affordability. Other implications include a future focus by the state government, not on hospitals, but on increasing access of care in rural areas of China, especially in the western regions, allowing the government to redirect resources more efficiently.

---

## With the rapid development of China's economy, it is unfortunate to see that the healthcare sector has not taken advantage of the nation's prosperity to grow at the same rate, in order to accommodate the people. As a result, private hospitals must step in.

---

tient care as required rather than strict government-set protocols, which often prevent doctors from treating patients with more personalized care. As such, there are varying types of private hospitals, including non-profits, basic clinics, VIP hospitals and specialty hospitals, as opposed to state hospitals, which were required to provide all specialties to all patients.

As a result of these advantages, the central government has also recognized many of the country's top private hospitals in a list of the top 48 healthcare institutions. The purpose of this is to aid private hospitals in building brand name recognition and consumer trust.

Other private hospitals are also hard at work improving, streamlining, and planning new strategic directions for

to manage the facilities. As the private sector gradually took the form of hospitals, they began to diversify in the form of specialty hospitals. The fourth trend has been the recent development of hospitals designed specifically to treat chronic diseases, usually in partnership with a level three healthcare facility, a hospital qualified to treat the most serious medical conditions. These level three hospitals are usually considered to be the best hospitals in China aimed at treating only the most serious conditions. Fifth, there was a trend for state-operated hospitals under the ownership of private investors although this is rare. The last trend has been the subsidization of private hospitals in areas of extreme need in order to increase the affordability and accessibility of healthcare.





*Photo courtesy of Clint Hall*

Another implication for the 2009 reforms includes the steady growth of hospital ownership and management by private companies. While previously ownership was limited to 70%, private companies can now wholly own for-profit

hospitals. This allows for unimpeded management and investment opportunities for foreign healthcare groups. This was further aided by the simplification of the process for foreign investment in the private healthcare industry. Unfor-

tunately, foreign companies will still be treated as such and be subject to higher taxes. On the other hand, joint ventures with the central government will allow certain advantages, such as tax exemptions for the first three years, at the cost



Photo courtesy of Clint Hall

of increase government control over management. These trade-offs will be a source of major concern to healthcare groups but will nevertheless present foreign investors with countless opportunities to tap into a strong emerging market.

Other reforms indicating the future growth of the private healthcare sector include the implementation of more lenient tax and regulatory policies, increasing incentives for employees at private hospitals, and supporting private Chinese hospitals in the acquisition of biomedical devices and expansion of facilities. The Chinese government will also have no preferential treatment towards treating its employees at either private or public hospitals. The reforms also made the acquisition of land for the construction of hospitals much cheaper and easier in hopes of boosting the number of hospitals accessible to the Chinese people.

However, while many of these reforms may promote the growth of the private healthcare industry in order to relieve pressure from the ministry of health, the central government will still not relinquish full control, creating several regulatory policies in order to police

and ensure productive growth. These regulations include strict adherence to laws regarding reimbursements from insurance to prevent fraud, a strict standard of care and code of ethics in order to maintain the trust of the public, a new regulatory mechanism to measure quality of care and patient satisfaction, and a mandate requiring for-profit hospitals to release annual reports regarding their profits and to list their investors.

### FUTURE TRENDS

With the rapid development of China's economy, it is unfortunate to see that the healthcare sector has not taken advantage of the nation's prosperity to grow at the same rate, in order to accommodate the people. In fact, society has created a high demand for health services of greater quality and increased diversity that the public healthcare industry cannot satisfy. As a result, private hospitals must step in in the next few decades in order to alleviate this demand and increase accessibility as a complement to state hospitals.

The private healthcare industry can do this by putting a greater emphasis

on providing a full range of integrated services such as the development of diverse, specialized healthcare services to serve all populations, no matter how segmented the market could become. Another crucial service that would be key to alleviating demand from public hospitals would be the untapped market of home-care and follow-up treatments. This is currently the weakest aspect of current healthcare services especially in regards to chronic diseases and geriatric illnesses. These diseases put the greatest strain on the public healthcare sector, because they often go untreated until hospitalization is required. As a result, the creation of assisted living facilities and community health centers would be a perfect place to aid in the accommodation of the public's healthcare needs.

1. Chinese Ministry of Health. Temporary Regulations for Hospitals and Clinics. China: Office of the State Council; 1951.
2. Chinese Ministry of Health. Healthcare Management Regulations. China: Office of the State Council; 1994.
3. Yu R. Presentation on Private Hospital and Regulations. China; 2011.

# Political Bottom-Up Approach to Global Health Problems

---

Great “Planners,” or individuals that propose huge plans of alleviating broad global public health problems, dominate the landscape of global public health. Titanic Planners, such as former United Kingdom Chancellor Gordon Brown, have proposed huge plans to eradicate many causes of morbidity and mortality in the world. However, Planners do not always devise public health initiatives that result in measurable successes. In *The White Man’s Burden*, William Easterly explains that the downfall of such public health movements is the fact that “Planners at the top lack knowledge of the bottom”.<sup>1</sup> In other words, Planners who devise big plans to meet certain health goals have no insight into the local health issues of actual importance. National institutions (full of Planners) dedicated to promoting sweeping changes in society ultimately fail due to lack of local support. The failure of these movements is most obvious in the developing countries that are recipients of this aid, where one can find the least local support and the most inefficiency. The United Nation’s Millennium Goals and other global public health objectives can only be met if this reality is addressed. In both developed and undeveloped countries, a strong political infrastructure and bottom-up public health initiatives that are built from the local up to the national need to be put into place. A sufficient environment where these global health initiatives can be carried out must be made up of the previously mentioned components. This call to ac-

tion mandates a strict political system that is coordinated and corruption-free. This transparency would accelerate the timeframe of implementing solutions, enabling them to be effectively carried out. It also allows for stable benchmarks to be installed evaluating success relative to established health indicators, such as mortality and morbidity. Secondly, this bottom-up approach means establishing national control, and enforcing tight regulations, at the local level. By creating this bottom-up environment across national and local levels, countries can pursue global public health initiatives more effectively.

Reflecting on the failures of Planners, the enforcement of global public health initiatives at a national level is ineffective unless coupled with support from local networks. For instance, Uganda, like other countries on the African continent, was hit with the HIV epidemic. However, unlike many other parts of Africa, Uganda experienced a decline in its HIV infection rate by the early 1990s. The major attribute, despite preexisting WHO structures, is the local community spirit in Uganda. At a time when most African countries were

ignoring the AIDs epidemic, “hundreds of tiny community-based AIDs groups sprang up in Uganda to comfort the sick, care for orphans, warn people about the dangers of unprotected sex, and address the particular vulnerability of women and girls to infection”.<sup>2</sup> The dedication of the locals shifted the norms of sexual behavior and “reduced AIDs-related stigma and denial”.<sup>2</sup> Local support, in

this case, originally jumpstarted the decline and accelerated the efforts of the preexisting institutional structures.

Even though the rates of HIV infection went down, there was heightened media attention towards the AIDS crisis, generated by returning journalists from Africa.

This limelight

on the issue spurred the creation of a United Nations General Assembly “package of public health interventions including condom promotion programs, mass media campaigns on radio, TV, billboards, HIV testing services, and STD treatment services”.<sup>2</sup> This preventative package was essentially the UN’s proposed enforcement at the continental level in carrying out a fight against the AIDS epidemic. Many of these programs

---

**In both developed and undeveloped countries, a strong political infrastructure and bottom-up public health initiatives [...] need to be put into place.**

---



Photo courtesy of Clint Hall

---

## **From enforcing certain policies to organizing the operation of economies, politics plays a huge part as the backbone structure in dealing with a country's problems.**

---

were already underway when the UN General Assembly convened for a special session. However, these programs alone, including the preexisting establishment of WHO bureaucratic structures, were not the main entities that drove down the AIDs epidemic, but they did contribute, along with local efforts to support the decline.

Finally, the rules governing initiatives of both local and national sectors in terms of global public health need to be equally established for a sound political system to be sustainable. By starting policies at the local level, there is tight control over local activities. Though Adam Smith's division of labor theory stresses that uncoordinated specialization leads to the inefficient use of global public health resources, it is foolish to assume that the national level will dictate the rules regarding local initiatives. In fact, the local level and the national level will together abide by the same rules and will serve as branches of a checks and balances system that will maintain accountability and cut down on corruption on both sides. Furthermore, the rules implemented in this system for

both sectors to follow will not be as rigid to disregard any feedback or new input. Before implementing any new global health initiative, both sectors need to be on the same page before changing any of their policies and maintaining a constant practice of them. And the last point to clarify about the establishment of these rules is that they will not be devised in the image of foreign donors. The shift of foreign health officials' focus towards particular global public health problems, such as the recent shift to NCDs (non-communicable diseases), may not always necessarily devise guidelines that are effective towards the local unique conditions of each developing country. Indeed, the national officials and local officials of a developing country are much better inclined to make these policy decisions regarding their own country, rather than blindly following a uniform global model advised by onlookers of the developing country's situation. The reinforcement of regulations at both levels allows for a sound political system, with a bottom-up approach to effectively run global public health initiatives.

In conclusion, a robust political infrastructure that uses a bottom-up approach to achieving public health goals is key to significant improvements in health. Essentially, coordination of both local and national sectors using a country-based political system that utilizes foreign aid effectively, to meet local objectives decreases health disparities in developing countries. From enforcing certain policies to organizing the operation of economies, politics plays a huge part as the backbone structure in dealing with a country's problems. Thus, an effective political structure will not only improve the economy, but also all other country sectors because of the inherent "organization" that it brings to the country. As a result, this "organization", which many developing countries such as

Botswana and Ghana lack, will allow for global public health programs to be effectively run from the bottom (local level)-up (national level). Interestingly, this "organization" will also further alleviate the age-old problem of many developing countries: sustainability. Ultimately, through these efforts, the "Planners" will be able to "hear whether the planned got what it needed" and thus will "accept responsibility for their actions" in terms of global public health initiatives, thus allowing for equal coordination on all levels.<sup>1</sup>

- 
1. Easterly, William. *The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done so Much Ill and so Little Good*. New York: Penguin; 2006: 6.
  2. Epstein, Helen. *The Invisible Cure*. New York: Farrar, Straus and Giroux; 2007: 160.





# FEATURES

*Photo courtesy of Rose Khin Mee Mee Win*

# Sub-Saharan Migrants & Morocco

## The Challenges of Tuberculosis Treatment

---

Despite its low prevalence in developed nations, tuberculosis continues to be a major international health concern averaging two million deaths per year. Tuberculosis represents a significant public health problem in Morocco, which has one of the highest incidence rates among North African countries. In addition, migration driven by economic issues has begun to change epidemiologic trends of tuberculosis throughout the globe, and

Morocco's proximity to Europe makes it a popular destination for both Moroccan and sub-Saharan peoples trying to migrate to Europe. Migrants, particularly those who are undocumented, often delay seeking treatment, waiting until the disease has progressed to a severe state.

In 2010, I began a Fulbright Research Grant in Rabat, Morocco, studying the unique cultural and social factors surrounding tuberculosis treatment for sub-Saharan migrants and how these factors impact the effectiveness of treatment. Through the use of interviews, personal narratives and a survey conducted at a public hospital, I identified methods that could be used by local

NGOs, in collaboration with public hospitals and clinics providing tuberculosis treatment, to encourage migrants to seek and adhere to treatment. One interview with a local pastor at a church in Tangier provided a strong overview of the major issues surrounding the treatment of tuberculosis in sub-Saharan populations. When asked if migrants had a fear of going to Moroccan hospitals for treatment, his answer was, "Absolutely." Yet he also

---

**When asked if migrants had a fear of going to Moroccan hospitals for treatment, his answer was, "Absolutely."**

---

noted that, "Many have gone and know they are not reported when they come to a hospital to seek help. Morocco is very random in dealing with migrants so it causes a lot of fear and uncertainty among them." Although not everyone is reported, just the possibility of being found by local authorities and

deported is enough to deter people from going to hospitals. In September 2010, Doctors Without Borders reported that 600 to 700 migrants from all over Morocco were identified and deported without warning.<sup>1</sup> They were taken to the 'no-man's land' that exists between Morocco and Algeria. One migrant described this area as "completely lawless" and said that he had heard of roving gangs of thieves who would hold you hostage until

you could find a way to pay off your debt. Whether or not this 'no man's land' actually exists is immaterial, as it is enough that migrants believe that deportation from Morocco precedes exile in a desert wasteland ruled by complete anarchy. This fear of deportation without due process causes migrants to avoid and suspect all Moroccan authorities.

The second issue has to do with fear of the social consequences of being diagnosed with tuberculosis. Due to the fact that most migrants live in tight communities, oftentimes several people to one small cramped apartment, there is a fear from public health officials that this type of environment is ripe for the transmission of tuberculosis. From the migrant perspective, there is the fear that someone who has tuberculosis will face the possibility of being asked to live elsewhere, and thus lose the community support. This causes many migrants to avoid seeking diagnosis and treatment in an attempt to avoid being ostracized from their communities. Tuberculosis treatment is provided free of charge at the public *Centre de Santé*, but often times patients are required to present legal documentation of their residency, which presents a problem for migrants without a legal address or are too afraid to list one.

The knowledge I gained of the situations and adversity that migrants face everyday provided me with insight into how they view tuberculosis and the



likelihood of their seeking treatment in Morocco. I used this information to help frame my questions to Moroccan health care workers in an effort to better understand both sides of the equation. It was through these interviews that I learned of one public hospital providing a unique opportunity for sub-Saharan migrants to receive medication from the hospital's pharmacy. Migrants without a legal address, and who were thus ineligible for free tuberculosis care in their neighborhood clinic, were able to receive the necessary medication as long as they had a referral from a certified doctor. A glaring problem, however, was the lack of coherent records for all patients receiving medication from the pharmacy. To improve organization of information, I created a basic survey to be completed by the medical staff when treating tuberculosis. The survey helped gather basic demographic information such as gender, nationality, and age. A discussion about the survey with the health care coordinator of a local NGO working with migrants verified that it protected the anonymity of migrants. It was then checked over by the director of the hospital, who added several suggestions, such as whether the patient was receiving ambulatory care and the severity of illness, to help benefit the medical staff.

The survey was used to establish an organized system for treating sub-Saharan migrants. A registry was created for the entire hospital. The survey, in addition to being used at the pharmacy for referral patients, was also administered to each wing of the hospital. With the registry and the surveys, the hospital now has a way to document and gather their own data on their treatment of sub-Saharan migrants. They will be able to track trends in default rates and the types of migrants seeking treatment. This long-term organizational implementation system is a small start that will hopefully have positive



*Photo courtesy of Komal Kumar*

long-term results in Morocco towards the treatment and control of tuberculosis among vulnerable populations.

Morocco has numerous challenges for the future regarding migration and tuberculosis. There are no indications of transnational migration from sub-Saharan Africa decreasing in the future, as Morocco is shifting from a transit point to a destination for migrants. This means that there needs to be a shift in long-term health policy and the control of infectious disease to accommodate this global movement across political borders.

The lack of a consistent national policy for treating illegal migrants creates a huge roadblock to controlling

infectious disease in Morocco. However, the positive impact of initiating a system for treating those without a legal address at the public hospital will hopefully lead to a similar initiative on the national level. Until then, the bulk of the responsibility falls upon the doctors, nurses and NGO workers to provide health services, and upon the migrants themselves to put their faith in the system and to seek and adhere to treatment.

1. Morocco: Expelled Migrants Left in Precarious State. Doctors Without Borders Website. <http://www.doctorswithoutborders.org/press/release.cfm?id=4770>. Accessed July 3, 2011.

# The Real Homestay Partner: A Husband

---

There has been a large focus in India on the inequality between men and women, which has spurred the emphasis of empowering women and addressing the Millennium Development Goal Number 3 of eliminating gender disparities. Through the media, anthropological studies, and personal narratives, we have become hyper aware of two significant events in a woman's life: marriage and childbirth. Tremendous attention and aid have been given to women and children in developing countries, which have led to improvement in both pediatric and maternal health. However, a huge factor affecting both of these variables has been neglected. Little focus has been placed on the male population- specifically the fathers.

During my recent public health study abroad experience in Chennai, India, my fellow students and I took on the challenge of studying the role of fathers during the prenatal and postnatal care of mothers.

How did we accomplish this? We predominately used qualitative approaches such as in-depth interviews and surveys. Twenty different surveys

were administered to fathers and single men in Egmore, Chennai, India with children ranging from ages zero to eighteen. These surveys had qualitative questions that were assessed as quantitative data and translated from Tamil to English. Each survey had both direct and open-ended questions that allowed participants to express themselves

---

**Most men expressed that they want their children to view them as a friend rather than as an authoritarian figure, and they want to give their children more freedom than they ever had.**

---

without a prompt. This format alleviated any bias in the responses. We interviewed and surveyed grandfathers, fathers, and single men from different socioeconomic statuses as well as experts on maternal health – an OBGYN, current medical students, and Dr. Solomon of YRG Care – in order to compile a very comprehensive pool of participants.

Based on our interviews, we collected a plethora of relevant data. When asked about their own families, most men reported that their fathers were rarely home, gone for long lengths of time, and unable to move the family to the job. A father's role was primarily that of a financial supporter. Most interviewees expressed that their own fathers had extremely traditionalistic views on

marriage and preferred sons as children. Across the board, grandfathers said that there was no sense of “shared responsibility” within the home. Women stayed home and took care of the children, while men worked outside the home. Even during pregnancy, the men played a very minimal role. The wife usually left home before delivery to be taken care of by her mother. The husband visited occasionally – usually weekends – and spent a minimum amount of time with his child for the first three months.

In our results, we also found that current fathers are still influenced by the traditionalistic values instilled by their own fathers. However, most respondents expressed that they want to raise their own children with more leniency than they themselves were raised. Most men said they value a son over a daughter; however, the increase in education for women has led to more men willing to let their wives work outside the home and has made them more encouraging of self help groups (not necessarily women empowerment groups). Most men reported a greater sense of independence for a variety of reasons, some of which include a drift from joint family to nuclear family, more time after marriage with their wives (waiting to have children until they feel “ready”), progressive views on fatherhood, less help and support from joint families, and women usually returning home after delivery. Current fathers expressed that they are struggling with combining the traditionalistic views from their own fathers and



*Photo courtesy of Lauren Villa*

grandfathers with the new “western” progressive views on fatherhood. They have taken on a greater responsibility in their family’s health by asking questions about their wife’s health in hospitals and helping her during prenatal and postnatal care. Most men expressed that they would like to be in the delivery room when their wife gives birth. However, only some private hospitals are beginning to allow this for a price because of the many government hospital restrictions, limited space and time. According to our results, we also found that future fathers have big plans! Most men plan to be as involved as possible. When thinking about becoming a father, most men expressed that they want their children to view them as a friend rather than as an authoritarian figure, and they want to give their children more freedom than they ever had. Almost all the men were supportive of female empowerment, higher education for women, and wives working during marriage.

Where is this shift coming from? Dr.

Solomon at YRG Care gave her opinion on the shift of a father’s view on parenting and shared responsibility. She found the shift to be generally consistent with the progression from generation to generation. She later commented on the gradual increase of the father’s interest in health, “They are asking more questions. It’s easy to see that they want to be involved in the medical process.” The father’s involvement is beneficial to the mother’s and child’s health. According to an OBGYN, husbands/partners/friends/relatives will accompany seven out of ten women in one day to the clinic. Although men are not allowed in the delivery room due to space limitations, most of the men interviewed expressed a desire to be with his wife during the delivery process.

What can we draw from this? Overall, single men today are eager and ready to jump into the role of “husband” and to take on the roles and responsibilities that this position calls for. After interviewing single men and fathers-to-be, it is clear that they want to be as involved

as possible in their wife’s prenatal and postnatal care. Almost all of the men expressed that they want to make future relationships with their children much more open than the ones they had growing up. Their positions on childbearing lend themselves more towards that of a friend than of an authoritarian. All of the fathers that were interviewed expressed that they would support their wives holding a paying job and would encourage her to attend women support groups.

Changing gender roles contribute to a more progressive Indian society. There is a greater understanding of shared responsibility within a household, and duties during pregnancy are increasingly shared between husband and wife. Women are gaining autonomy, and this may be due to the increase in exposure to western lifestyle trends, fast and cheap travel, global communication, and interconnectedness in our ever changing and expanding global society.

# Water Losers

## Riverside Effects of China's Hydroelectric Dams

---

### DAMS IN CHINA: IMPERFECT SOLUTIONS

What constitutes a catastrophe if not 124 meters of rock and concrete crumpling to the earth?

This is what Jonathan Sinton, China's program manager at the International Energy Agency frets over as construction of large dams accelerates in western China.

Chinese dams are emblems of economic development. They create hydropower and control floods. Instrumental in spreading irrigation, they increase the nation's agricultural capacity and supply. They assert, in the technological marvel of their scale alone, the dominance of Chinese scientists and engineers. Dams are a point of national pride. Thus it is no surprise that when China pledged to cut its greenhouse gas emissions by 40-45% of 2005 levels at Copenhagen, a large portion of their new energy agenda depended on the construction of large dams.

The National Development & Reform Commission created the New Socialist Countryside program to "promote strategic, sustainable agriculture." Under this program, twelve large dams are being constructed on the nation's western, alpine rivers (a visual/map here). To this end the government has pledged upwards of 62 billion US dollars. Engineer Mingjiang Deng describes the dams as "an effective measure to control and regulate rational allocation of water resources." The Chinese Ministry holds that China is "carrying out [dam construction] according to the principles of

sustainable development." Highlighting the adjacent irrigation canals, the Ministry notes that by increasing the region's agricultural productivity, dams will allow rural farmers to contribute to the national food system helping to support the heavily populated eastern coast, and sustain the nation as a whole.

This is an aerial view, in which a sin-

---

**"In western China," Fan Xiao, a Sichuan province geologist, continues, "the one-sided pursuit of economic benefits from hydropower has come at the expense of the people, the environment, the land, and its cultural heritage."**

---

gle dam and its associated risks, is just one small piece of the overall perspective. This perspective is prudent, if not necessary, for a country of such magnitude and rapid development. Taken, however, from a great distance, the Ministry's outlook fails to acknowledge the realities along the river bed.

Dams create stark environmental degradation. The silt accumulated in their reservoirs alters agriculture upstream. As water seeps into the pores in underlying rock, it decreases the shear stress--the stress one sliding rock exerts on another--the earth can tolerate, and leaves the area vulnerable to earthquakes.<sup>1</sup> Reservoirs, naturally a darker color than the snowy ecosystem, absorb more solar radiation, transfer more heat to the surrounding area, and therefore can accelerate glacial melt (which, ironically, is what some of the dams were originally intended to control). Dams decrease biodiversity, already marginal in alpine environments, and increase the frequency of landslides. They have a history of being so disruptive that, "many environmentalists contend that electricity generated by large dams should not be considered renewable because of the [accompanied] social and environmental damage."<sup>2</sup> "In western China," Fan Xiao, a Sichuan province geologist, continues, "the one-sided pursuit of economic benefits from hydropower has come at the expense of the people, the environment, the land, and its cultural heritage." If sustainable development is defined as development which can be stable and indefinitely maintained, then large dams must be considered unsustainable.

But, what is? International agreement, notes that current energy technologies - predominantly involving coal - that support China's population are also unsustainable. There's no silver bullet. The sad--and more complicated--question becomes, are large dams too unsustainable? Are their consequences



*Photo courtesy of Clint Hall*

dire enough, or the risks associated with them large enough, that they should not be built? And how is that threshold defined?

This is what Sinton, and many others, are trying to unravel. What would it mean for the farmers along the river bank, for the Shanghai dwellers relying on the western crops, and for the thousands in a downstream Indian river delta--if the 124 meters of a newly constructed dam succumbed to an earthquake and fell? Is that likely? Does the power produced by the dam merit the more subtle, but still sizable, subsequent degradation of riverside ecosystems

and cultures? Could this destruction be minimized or completely avoided if the power was coming from another source--or would it just be located somewhere else?

"There are no ideal choices," Sinton aptly remarks.

#### **DAMS IN CHINA: THE HUMAN ENVIRONMENT**

New York Times journalist Jim Yardley writes, "[Large dams] lie at the uncomfortable center of China's energy conundrum," simultaneously reducing the nation's reliance on coal-fired power plants while generating human and environ-

mental upheaval. Arguably, none know this discomfort more than the millions of riverside peoples displaced by recent dam construction.

Though local governments praise dams as opportunities to raise provincial revenue and urbanize, the mood along the Keriya River's shore, one of twelve rivers where dam construction began over a year ago, remains weary and palpably tense. At the river's edge, what the dams will bring remains uncertain; what they have already taken away is great. "I am a farmer," a wrinkled man says in Ugyur, the local language, "But now I work construction." Like many



*Photo courtesy of Komal Kumar*

of the other men sleeping in the canvas construction tents, he once grew millet and herded sheep downstream of the dam. His grandfather settled alongside the Keriya, furrowed sandy trenches for irrigation, and eventually passed on the right to water, as is traditional among the Uygur, as a form of property to his son. In time, this man inherited the same. However, with the construction of the dam, the water supply downstream decreased, causing the trenches to clog. No longer able to sustain his fields, or himself, this man was forced to join the construction labor force.

In its report of water scarcity, the Food and Agriculture Organization, a branch of the United Nations, chronicles this all-too-common story:

“Farmers, small rural enterprises, herders and fishing people—all need water to secure their livelihood. However, as the resources become scarce an increasing number of them see their sources of income disappear. Silently, progressively, the number of water losers increases—at the tail end of the irrigation canal, downstream of a new dam, or as a result of excessive groundwater drawdown.”

Alongside the Keriya, fifty of these “water losers” hunt for jade in the river’s shallows, or nap in the shade of cement block piles, waiting for the midday heat to subside. Like the Uygur man, many of them are also displaced farmers. Will they go back to farming? They shake their heads. Plots along the newly built canals are expensive, and though some were compensated for the loss of their fields, the plots remain unaffordable. To re-establish themselves upstream seems impractical as more construction is already planned. Nor does permanent employment with the hydropower companies seem likely: available jobs are given first to the ethnic majority, which they are not. They speak of construction work with nomadic resignation. In listening, you get the impression that in spreading sustainability via water resources to one region, the dams have taken, from those it was meant to help, the ability to sustain themselves.

In a statement outlining the dam-based sustainable development plan of western China, the National Development and Reform Commission declared, “Facing the future, we are standing at a new, historic starting point.” Where

to go and what route to travel, are by no means simple questions, and chances are all answers will cause some measure of discomfort. Watching the construction men pack into their tents exposes the scars that dams are creating on the rivers’ human environments. Once a relatively stable, self-reliant population, these farmers have been stripped of their cultural roots, and dropped—largely unaided—into a life of transient dependence. You begin to wonder, then, when the rhetoric of sustainable development was being drafted, for whom did the authors mean “sustainable”? For how long? And starting when?

- 
1. Nelson, Stephen. Slope Stability, Triggering Events, Mass Movement Hazards. November 11, 2011. <http://www.tulane.edu>. Accessed January 14, 2012.
  2. Yardley, Jim. China’s Three Gorges Dam. The New York Times. November 19, 2007. <http://www.nytimes.com> Accessed January 14, 2012.

# How to Grow an Independent Study Project in the Desert

## Reflections from the Valleys

---

I spent spring semester of 2011 in Arica, Chile on a School for International Training (SIT) study abroad program entitled “Public Health, Traditional Medicine, and Community Empowerment”. As a central component of the learning experience, each SIT student completes an independent study project on a topic of his or her choosing during the last month of the program. While the results of these studies are important and often lay the framework for future research, many students agree that the actual *process* of conducting one’s own field research project is the richest part of the experience.

As was the case for many other SIT students, my independent study project grew out of a profound experience I had during the course of my program. While visiting the pediatric intensive care unit of the regional public hospital Dr. Juan Noé, our group encountered an infant suffering from acute intoxication – his mother had given him an overdose of Tylenol. When we asked if this was common, the nurse replied that a more common cause of intoxication in children was pesticide exposure. She explained that rural children from the nearby valleys of Azapa and Lluta were occasionally brought to the hospital to receive treatment for acute pesticide intoxication. Having spent most of our time in Arica, many of us were unaware of the unique health concerns of the rural population living just outside of the city

limits.

As I walked back down Calle 18 de Septiembre to my homestay family’s house, I thought about the nurse’s comment. I hadn’t asked her about the frequency of the problem, but it seemed to me that any occurrence of pesticide intoxication among children was tragic and should be easily preventable. I couldn’t think of a logical reason why a young child, even one living in a rural area, would come into contact with pesticides at the level required to produce symptoms of acute intoxication.

And if a handful of children were presenting signs of intoxication, how many more rural children were being exposed to smaller, but chronic, doses?

These questions and concerns evolved into my independent study project. I set out to characterize the risk of pesticide exposure for children under the age of six living in the rural communities of Azapa and Lluta. I sought to learn about the perceptions held by mothers of young children, who used the local health posts, concerning their children’s risk of pesticide exposure. I also sought to identify specific circumstances and

behaviors that contribute to the risk of exposure among these children. With the help of my academic director, I arranged to work with the rural health team in order to access my population of interest.

During the month of May, I com-

muted from Arica to the Azapa and Lluta Valleys with a team of paramedics, nurses, and social workers. Fitting the fourteen of us into the small, blue and yellow minivan was a near-impossible task that required great flexibility and athleticism, but they kindly accepted me into their ranks and together

we made the daily trip to the rural health post San Miguel de Azapa. While there, I worked closely with Ms. Katherine Montecinos, a nurse involved in the “Control de Niño Sano” program, which provides regular health examinations for children under the age of six. I had the privilege of shadowing her to learn about her work with the patient population. Some days I would accompany Ms. Montecinos and a subset of the rural health team as they trekked further into the Azapa Valley to the rural health post Sobraya, or across the desert plateau to the adjacent Lluta Valley, in an effort to improve access to

---

**And if a handful of children were presenting signs of intoxication, how many more rural children were being exposed to smaller, but chronic, doses?**

---



*Photo courtesy of Komal Kumar*

---

## She described the Agro as the place where two worlds meet – and I couldn't agree with her more.

---

care in remote communities.

Traveling out of the city and into the valleys was an experience in itself. San Miguel de Azapa is just a half-hour drive from the city of Arica but the change

in surroundings is remarkable. I was reminded of the time I had driven out of Las Vegas and into the Mojave Desert on a family trip. Like Las Vegas, the city of Arica abruptly ends and is replaced by a barren and seemingly inhospitable landscape. The Azapa and Lluta Valleys are two exceptions in the otherwise desolate Atacama Desert. When viewed from the sky, the sister valleys are fertile green fissures that snake inland from Arica, cutting into a plateau that gradually rises to meet the Chilean Andes.

The Atacama, which spans northern Chile and parts of Peru and Bolivia,

is known as the driest place on Earth. During my four-month stay in Arica, I experienced a grand total of five minutes of rain – if the light mist that drifted down to the thirsty Atacama sands could even be described as rain. These arid conditions, which helped to preserve the Chinchorro mummies (the oldest in the world) in the Atacama sands for over 7,000 years, also restrict agriculture in the region. However, the farming communities of Azapa and Lluta have found ways to overcome this limitation by diverting water from the seasonal rivers that run through each valley and through



ingenious fog harvesting methods that capture water droplets from the coastal fog that rolls into the valleys each morning. The narrow stretches of fertile land are the primary source of livelihood for the many families who farm them.

Over the course of my project I learned that most of the families of Azapa and Lluta are tenant farmers, many of which are Peruvian or Bolivian migrant workers. They farm a plot of land and usually live directly on or adjacent to that plot in a small house owned by their landlord. The very geography of the valleys dictates that virtually the entire population is concentrated on farmland. The massive dunes that rise up on either side of Azapa and Lluta offer little support for crops or homes. The population's proximity to farmland captured my attention because of the associated risk of airborne pesticides drifting into homes and schools.

At each rural health post, Ms. Montecinos met with mothers and their young children to provide examinations for children under the age of six. After each exam, she directed mothers to a private room where I explained my project, obtained written consent from willing participants and administered a questionnaire that I had developed to learn about the perceptions, practices and knowledge of the mothers with regard to the risk pesticides posed to their children. It also included a series of questions designed to better understand the demographics of my sample. The questionnaire was administered in the form of a verbal interview to allow illiterate mothers to participate.

The entire interview experience was completely new to me. Since I had never worked in the rural health posts or designed a questionnaire before, the first week served as a much-needed test period. During this time, I worked with Ms. Montecinos and my academic direc-

tor to make the questionnaire's content and language relevant and appropriate for the rural population. One of the first realizations I had during this test period was that overcoming a language barrier involves much more complexity and subtlety than being able to hold a basic conversation. I was fairly confident in my conversational Spanish; I had many years of academic Spanish under my belt and had regularly used my Spanish for three months in Chile prior to my independent study project. But I soon learned that this would be insufficient to communicate effectively with the rural population of Azapa and Lluta.

This became clear when I sat down with one mother to run through a series of pilot questions that I hoped to include on my final questionnaire. I asked the woman if she or anyone that she lived with applied pesticides. She looked confused, hesitated, and then started telling me all about AIDS. I was surprised, but I quickly realized my blunder. I had used the Spanish term for pesticides, *plaguicidas*, of which the last two syllables sound reasonably close to SIDA, the Spanish acronym for AIDS. Embarrassed, I repeated the term *plaguicidas*, hoping that I was speaking more clearly this time. She still looked confused. Finally, I defined the term as best I could, explaining that pesticides are poisons that are applied to crops to protect them from insects. Her eyes lit up; there was an instant understanding. She was very familiar with the use of pesticides, just not with the word.

As my first week in the rural health posts continued, I realized the same was true of many of the women I interviewed. It surprised me that these women, many of whom worked with pesticides or had husbands who worked with pesticides on a regular basis, weren't familiar with my terminology, while their urban neighbors in Arica were. My interviewees referred

---

## I asked the woman if she or anyone that she lived with applied pesticides. She looked confused, hesitated, and then started telling me all about AIDS.

---

to pesticides as *venenos* (poisons) or described them broadly as substances that are applied to protect crops. I knew this insight called for some rethinking and from that point on I became increasingly perceptive of the rural vernacular. The local community also had distinct words that they used to refer to their individual plots of land and to larger areas of farmland – words not taught in a typical college course. I knew that individual plots of land could be called *parcelas*, but I learned that farmland is more generally referred to as the *chacra* in Andean nations. I worked rigorously with Ms. Montecinos and my academic director to incorporate these terms into my questionnaire and to better equip myself to communicate. The result was a rich and rewarding interview process during which I not only answered my research questions but also learned a great deal about the people of Azapa and Lluta and their lifestyles.

In the valleys, pesticide use is frequent and ubiquitous. The proximity of homes and schools to the *chacra* means that small exposures to pesticides occur regularly in the general population. Some mothers complained that pesticide residues could drift into their children's schools. One mother reported being

exposed at home along with her family when a neighbor was fumigating his field. At the same time, there was great variability and uncertainty among the interviewed mothers about their families' perceived levels of exposure and the resulting health effects. Their uncertainty grew both from the deceptive nature of airborne pesticide exposure and from their lack of knowledge of the associated health risks. Three-quarters of those interviewed lived on or immediately adjacent to a *parcela*, but less than half could name a risk associated with pesticide exposure. Furthermore, since some farmers obtained their pesticides from unregulated sources, there was a degree of uncertainty about the potency of the compounds being used.

During one of my first interviews with a young mother, she explained to me that her first child had been born with a heart condition and eye problems. The child had died, and the doctor had told her that her own exposure to pesticides while pregnant might have exposed her fetus and caused the defects. In fact, the mother reported having applied pesticides in the *parcela* during the course of her pregnancy. It was a shock to be confronted with such a tragic and personal story. Even after my careful preparation for the interview process, I struggled to find the right words to adequately convey my sympathy to her. This experience also inspired me to develop educational materials about maternal and child risk of pesticide exposure, which I provided to mothers during the remaining interviews.

Another mother I spoke with had a similar story. Her child had been born with ear malformations, and the doctor had attributed the defects to her own exposure while pregnant. My survey indicated that among the mothers that farm, more than half bring their young children with them while they are work-

ing in the *chacra*, often strapping the infants across their backs with blankets. Cause and effect relationships are hard to prove when considering pesticide exposure, and my project was not designed to perform such analyses, but my findings raised important questions about the relationship between maternal practices and the risks to their children – and to their unborn fetuses.

On my last day in Arica, I passed the Agro, a massive fruit and vegetable marketplace positioned at the very point where the city meets the Azapa valley. Bella Siegel, my friend on the SIT program and a fellow Hopkins Public Health Studies undergraduate, was there with me. She described the Agro as the place where two worlds meet – and I couldn't agree with her more. The Agro is where Arica, the Chilean port city seized from Peru in the War of the Pacific, goes to buy its produce – largely from the Peruvian, Bolivian, and indigenous Aymara families of Azapa and Lluta. I knew Arica well – I had lived there with my homestay family for three months. But by equipping myself to more aptly communicate with the rural population, I was able to gain insight into the less visible communities of Azapa and Lluta as well. Through this process, I gained an appreciation for the importance of clear communication that I will carry with me through future public health and medical pursuits.

*My independent study project, in Spanish, is available online at: [http://digitalcollections.sit.edu/isp\\_collection/1053/](http://digitalcollections.sit.edu/isp_collection/1053/)*



*Photo courtesy of Sandhira Wijayaratne*



PE



# RSPECTIVES

*Photo courtesy of Sandhira Wijayaratne*

# Exploring Risk-Taking and Risk-Avoidance from a “Whole Person” Vantage Point

---

When presenting and lecturing on sexual risk-taking behaviors, the audience inevitably laughs when I say “No one thinks to themselves ‘It’s Friday night and the feeling’s right...Woohoo, I want and intend to contract an STI tonight.’” I have yet to find a respondent who tells me that he/she wants to contract a sexually transmitted infection like gonorrhea or HIV. No individual wants to experience the painful urination, oozing discharge, permanent sterilization and other possible discomforts that may result from untreatable and recurring STIs.

Although certain sexual choices (e.g., sexual partner characteristics) and behaviors (e.g., use of protection methods, such as condoms and sexual abstinence) mitigate the risk of STI contraction and transmission, all sexually active individuals are at-risk, regardless of their age. My interest in STI contraction lies particularly in the adolescent period, which is the human developmental period involving the greatest risk-taking behaviors, the greatest experimentation, and incomplete brain development. Essentially, STI and HIV transmission are 100% preventable. Yet, youth from ages 15 to 24 (who make up only one-quarter of the sexually active population) contribute half of all new STI cases annually in the US, indicating a possible epidemic of massive proportions.<sup>1,2</sup>

Despite the preventive education focused on STI contraction and transmission – namely, completely abstaining from any type of sex or the availability and correct use of barrier methods (e.g., condoms, dental dams) during all sex acts (oral, vaginal, and anal), people willingly and knowingly engage in behaviors that place them at risk. Why? The short answer: there is no direct correspondence among wants/desires, intentions, behaviors, and outcomes. Where is this disconnect found? There are many possible intervening factors between intentions and behaviors, which include brain functioning and structure (indicators of forethought, impulsivity, inhibitory control, emotion regulation, brain maturity), hormones (e.g., libidinal urges, stress), substance use, couple/relationship factors (e.g., power differences, displays of trust), personality, etc.

My research agenda is to explore the “black box” between intentions and behaviors. Specifically, in addition to social, psychological, and family influences on intentions and behaviors, I incorporate neurological and endocrine determinants into my research on sexual and substance use “decision-making.” Historically, social science and biomedical disciplines have not interacted and have operated independently. Recently, the National Institutes of Health and

other science organizations are advocating for greater integration of the fields that constitute these disciplines, such as psychology, sociology, anthropology, economics, neuroscience and endocrinology. Most likely, brain development, hormones, psychology (e.g., perceptions), and context (e.g., poverty, norms) intersect to play important, but unexplored roles in the disconnect among STI/HIV knowledge, risk perception, intentions, and behaviors. To date, no study has simultaneously attempted to link these multiple influences to adolescent decision-making and risky behaviors. My current research agenda exemplifies an effort toward this interdisciplinary and comprehensive, “whole person” approach.

Where does the brain fit into this agenda? Both emotions (e.g., impulsivity, reward systems) and cognition (e.g., planning, abstract thinking) play a role in the decision-making process. As the brain matures throughout adolescence and into young adulthood (into the late 20s and possibly early 30s), cognitive control brain regions (e.g., prefrontal cortex) developmentally catch-up to and sometimes supersede the socio-emotional brain regions. On average, relative to adults, youth base their decisions more on emotions rather than on cognition.<sup>3,4,5</sup> We, as adults, however, are not helpless

when it comes to preparing youth for the challenges of adolescence, which occur at a time of great cognitive and emotional vulnerability.

One preventative direction involves mindfulness-based approaches, relevant for all ages from childhood into older age. Mindfulness programs target cognitive control skills by enhancing attention, decreasing distraction and rumination, and reducing stress via techniques that foster present-moment awareness. In Baltimore

City, mindfulness-based strategies have demonstrated effectiveness with increased emotional regulation and cognitive control in children as young as 10 years old.<sup>6,7</sup> The utility of these programs has been established for older adolescents and adults; but the link between mindfulness and risk-taking decision-making among adolescents has not been made. One long-term goal of my current basic research is to develop future prevention and intervention strategies that will enhance a more direct correspondence between a person's intentions, behaviors, and outcomes. I believe mindfulness will factor into this strategy.

What do hormones have to do with risk-taking or risk-avoidance? Numerous studies indicate a relationship between high androgen levels (e.g., testosterone) and dominance, aggression, competitiveness, libido, sexual risk-taking, romantic relationship behaviors, and substance use.<sup>8-12</sup> The libidinal urge

to engage in sexual activity is incredibly powerful biologically (e.g., androgens such as testosterone) and even more so

with social influences, (e.g., peers, partners) exerting pressure to take risks that often supersede rationality for youth.<sup>13</sup> Furthermore, physiological (e.g., cortisol production) and perceived stress are linked to increased vulnerability of drug use and abuse because of heightened sensitivity to drug effects.

Essentially, I study the "whole-person" inside the

skull via brain imaging and neuropsychological tasks, under the skin via body fluid collection (e.g., saliva, urine, blood), and other external influences (e.g., peers, family, environment, culture). Then, I include the variable 'time' into the equation (longitudinal exploration) because the biological and the social influence developmental patterns and timing.

This approach helps clarify intentions, behaviors, and outcomes. This interdisciplinary, longitudinal research requires respondent willingness to provide biological specimens, answer sensitive survey questions, complete neuropsychological tasks outside and inside an fMRI scanner over at least two time points, and respond to randomly timed text (SMS) message questions about their behaviors over the course of a year. This extensive research takes time and a significant amount of funding, given the fact that biological assaying and imaging data collection, processing, and analysis are

quite expensive. But, the data garnered from these efforts are priceless in terms of the types of research questions that they can help answer and the insights that they provide into prevention and intervention strategies. These strategies are designed to enhance people's lives through more direct connections between their intentions, behaviors, and desired outcomes.

Risk-taking is not necessarily a continuum. There may be different types of risk-taking and different dimensions on which it needs to be simultaneously measured to provide an accurate portrayal. Not all risk is created equal and not all risk-takers traverse the same pathways. Some people are complete risk-avoiders, taking the conservative and safe route through life. Other people take calculated risks, weighing the benefits and consequences in a "cost-benefit analysis," similar to what economists refer to as rational decision makers. Yet, other people are ambivalent about their preferences and go in the direction the pressure or mood takes them. Still, other people seek out and thrive on the thrill of risk-taking. There may still be other types of risk takers. To make it more complex, risk-taking tendencies may be state-like (susceptible to changing across domains of risk such as financial, physical, sexual, substance) and not necessarily trait-like (where a person has a stable risk proclivity).

In a recent study using neuropsychological risk-taking and decision-making tasks in a laboratory experiment, my colleagues and I found that even among Ivy League college students who have demonstrated extensive cognitive abilities and academic success, three different clusters of risk-takers emerged: conservative, calculating, and impulsive risk-takers.<sup>14</sup> Furthermore, when presented with stressors, risk-takers performed differentially under stressful conditions

---

## **Yet, youth from ages 15 to 24 (who make up only one-quarter of the sexually active population) contribute half of all new STI cases annually in the US, indicating a possible epidemic of massive proportions.**

---

relative to non-stressful conditions with impulsive risk-takers taking even more risks, calculated risk-takers taking fewer risks, and conservative risk-takers maintaining low levels of risk. This research highlights that controlling for cognitive ability, academic success, and socioeconomic status results in three distinctly different types of risk-taking clusters. Thus, risk-taking among members of these clusters varies as a function of environmental factors (in this particular study, this refers to induced stress).

When studying sexual risk-taking behaviors across adolescents (ages 15-26) for a nationally representative sample of men, my colleagues and I discovered that when two dimensions of sexual risk-taking are examined simultaneously – partner type and condom use – five clusters emerged: three low-risk clusters (no heterosexual sex, low risk partners with low condom use, low risk partners with high condom use) and two high risk clusters (risky-partners with high condom use and many sexual partners with moderate condom use).<sup>15,16</sup> We further examined both clinical (urines) and self-reports of STIs for each cluster. Positive STI reports varied across the clusters with men who had many sexual partners and moderate condom use reporting the highest level of lifetime and recent STIs (within the last 12 months), with the risky-partners high condom use cluster following closely behind. Men in the low risk clusters also reported experiencing STIs, although at a substantially lower level relative to both high-risk groups. After these conclusive research findings, the question still remains: why are some people risk-avoiders, others calculated risk-takers, and still others impulsive or more extreme risk-takers? My recommendation to answer this complex question is that research studies need to simultaneously examine the intersection of social and psychological influences



with brain functioning and hormones. There are other biomarkers, such as allostatic load, that would be excellent additions to this multidisciplinary approach. These biomarkers, however, require more complex data collection procedures and more funding.

As a junior faculty member in the

Department of Population, Family, and Reproductive Health at the Johns Hopkins Bloomberg School of Public Health, I convinced reviewers at the National Institutes of Health that my “big picture” conceptual model has merit and can be assessed during the five years of my training grant. I am currently in the





*Photo courtesy of Clint Hall*

second year of my grant. My previous training was in Human Development and Family Studies, as well as Statistics. But in order to move forward with my research agenda, I sought out training in neuroscience and endocrinology. Although I do not want to become a “Jack of all trades and a Master of none,” I need to

acquire enough knowledge in these additional fields to collaborate with masters of these fields to conduct sound science. Collaboration is fundamental and essential to any “big picture, whole person” approach. I created a team of phenomenal mentors (Drs. Gregory Ball, Michelle Carlson, John Desmond, Monique Ernst,

Douglas Granger, and Gary Wand) for my training grant and continue to make connections with experts in these and other fields to move this agenda forward both domestically and internationally. I have specifically chosen to focus on sexual and substance use risk right now. But, my work translates to so many other



Photo courtesy of Clint Hall

areas of interest including interpersonal violence, food addiction, and so forth, making it appealing to other potential collaborators. It has been a challenging proposition as a junior faculty member; but, if accomplished, the strides that will be made in the future are that much more vast and promising.

- 
1. Weinstock, H., Berman, S. and Cates, W., Jr. Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health*. 2004;6(1):6-10.
  2. Centers for Disease Control and Prevention. HIV/AIDS Surveillance Report, 2006. Vol. 18. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2008. Available at <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/>.
  3. Steinberg, L. A social neuroscience perspective on adolescent risk-taking. *Developmental Review*. 2008; 28: 78–106.
  4. Yarkoni, T., Braver, T.S, Gray, J.R, and Green, L. Prefrontal brain activity predicts temporally extended decision-making behavior. *Journal of the Experimental Analysis of Behavior*. 2005; 84: 537–554.
  5. Yarkoni, T., Gray, J.R., Chrastil, E.R., Barch, D.M., Green, L., and Braver, T.S. Sustained neural activity associated with cognitive control during temporally extended decision making. *Brain Res. Cogn. Brain Res*. 2005; 23: 71–84.
  6. Dariotis, J., Mendelson, T., & Blanchard, J. Mindfulness Makes a Difference in the Lives of Urban Youth. *Adolescent Matters: Issues Brief*. 2011: 1-6.
  7. Mendelson, T., Greenberg, M.T., Dariotis, J., Feagans Gould, L., Rhoades, B., & Leaf, P.J. Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. *Journal of Abnormal Child Psychology*. 2010; 38:985-994.
  8. Booth, A., Granger, D.A., Mazur, A., and Kivlighan, K.T. Testosterone and social behavior. *Social Forces*. 2006; 85: 167-191.
  9. Cashdan, E. Hormones, sex, and status in women. *Hormones and Behaviors*. 1995; 29:354-366.
  10. Reynolds, M.D., Tarter, R., Kirisci, L., Kirillova, G., Brown, S., Clark, D.B., and Gavaler, J. Testosterone levels and sexual maturation predict substance use disorders in adolescent boys: A prospective study. *Biol. Psychiatry*. 2007; 61:1223–7.
  11. Udry, J.R., Morris, N., & Kovenock, J. Androgen effects on women's gendered behavior. *Journal of Biosocial Science*. 1995; 27 : 359-369.
  12. Kalis, A., Mojzisch, A., Schweizer, T.S., and Kaiser, S. Weakness of will, akrasia, and the neuropsychiatry of decision making: An interdisciplinary perspective. *Cognitive, Affective, and Behavioral Neuroscience*. 2008; 8(4):402–417.
  13. Smith, E., Udry, J., and Morris, N. Pubertal development and friends: A biosocial explanation of adolescent sexual behavior. *Journal of Health and Social Behavior*. 1985; 26:183–192.
  14. Johnson, S.B., Dariotis, J.K., & Wang, C. Adolescent risk-taking under stressed and non-stressed conditions: Conservative, calculating and impulsive types. Submitted to *Journal of Adolescent Health*, Under review special issue.
  15. Dariotis, J.K., Sonenstein, F.L., Gates, G.J., Capps, R., Astone, N.M., Pleck, J.H., Sifakis, F., & Zeger, S. Changes in Sexual Risk Behaviors as Young Men Transition to Adulthood. *Perspectives on Sexual and Reproductive Health*. 2008; 40(4): 218-225.
  16. Dariotis, J.K., Sifakis, F., Pleck, J.H., Astone, N.M., and Sonenstein, F.L. Racial and ethnic disparities in sexual risk behaviors and STDs during young men's transition to adulthood. *Perspectives on Sexual and Reproductive Health*. 2011; 43(1): 51-59.

**Adnan A. Hyder, MD, MPH, PhD<sup>1</sup> (with Jeffrey Lunnen, MS<sup>2</sup>)**

*1, Associate Professor of International Health and Director International Injury Research Unit, Johns Hopkins Bloomberg School of Public Health*

*2 Research Program Coordinator, Johns Hopkins International Injury Research Unit, Johns Hopkins Bloomberg School of Public Health*

---

# Global Decade of Action for Road Safety 2011-2020

## High Time to Stop Carnage on our Roads Targeting the Sources of Ambient Air Pollution

---

This past month, two more teenagers died in Baltimore from a car crash at Fells Point. The deaths of these college freshmen, one from Stevenson and the other from Morgan State University, are terrible events that will affect their families for years to come. Each year, more than 1 million people die on roads across the globe.<sup>1,2</sup> The World Health Organization (WHO) estimates by 2030, road traffic injuries (RTIs) will be the 5th leading cause of death worldwide, corresponding to more than 2 million deaths a year.<sup>2,3</sup> Despite having less than 50% of the world's registered vehicles, more than 90% of RT fatalities occur in low- and middle-income countries (LMICs).<sup>1</sup> Nearly half of those deaths occur among people referred to as “vulnerable road users”, such as pedestrians, cyclists, and those using motorized two- or three-wheeled vehicles.<sup>1</sup> RTI affects mainly young, bread-winning males in LMICs who are struck down in their most economically productive years. They leave behind family members who often struggle to cover unforeseen funeral expenses and make a livelihood in the absence of their loved ones.<sup>1</sup>

An additional 20-50 million people are seriously injured in road traffic crashes every year, many of which result in disability.<sup>1,4,5</sup> Global losses due to RTI

are estimated to be US\$ 518 billion, costing governments between 1% and 3% of their GDP.<sup>1,5</sup> These costs are greater in LMICs where many public health systems have yet to prioritize and therefore, have minimal resources to combat this growing burden. In fact, this estimate is much higher than the total development assistance received by such countries on an annual basis.<sup>6</sup>

Evidence tells us that RTIs are not “accidents”. Public health science has revealed that the causes of road traffic injury can be identified, and ultimately prevented and controlled. Until recently, however, this information was not being heard in LMICs.

Within the last ten years, public health professionals, governments and civil society organizations alike have made tremendous strides in confronting the burden of RTI with calls for research, greater evidenced-based interventions,

and the drafting as well as the implementation of holistic road safety policies. Their efforts catalyzed the UN Road Safety Collaboration (UNRSC)'s *Decade of Action for Road Safety 2011-2020*,

which officially launched in May 2011. The UNRSC aims to reduce the burden of RTI by adhering to and fully implementing the major UN road safety related agreements and conventions, developing and implementing sustainable road safety strategies and programs, and setting an ambitious yet feasible target for reduction of road fatalities by 2020. UNRSC also aims to strengthen the management infrastructure and capacity for technical implementation of road safety activities, improve the quality of data collection, monitor progress and performance on a number of predefined indicators, and encourage increased funding to road safety and better use of existing resources at

---

**The World Health Organization (WHO) estimates by 2030, road traffic injuries (RTIs) will be the 5th leading cause of death worldwide, corresponding to more than 2 million deaths a year.**

---

the national, regional and global levels.<sup>7</sup>

*The Johns Hopkins International Injury Research Unit (IIRU)* participated in the launch of the *Decade of Action for Road Safety* and is currently working with a consortium of partners to improve road safety in 10 LMICs around the world. Dubbed as the *Road Safety in 10 Countries project (RS-10)*, the five-year initiative draws on support from Bloomberg Philanthropies to implement road safety interventions where they are needed most. Many of the project's objectives mirror those of the Decade of Action. IIRU is working in the RS-10 program with 5 partners: World Health Organization ([www.who.int](http://www.who.int)), Association for Safety International Road Travel ([www.asirt.org](http://www.asirt.org)), Global Road Safety Partnership ([www.grsp.org](http://www.grsp.org)), World Bank Global Road Safety Facility ([www.worldbank.org/grsf](http://www.worldbank.org/grsf)) and EMBARQ World Resources Institute ([www.embarq.org](http://www.embarq.org)). Interventions will address critical risk factors for RTI such as helmet wearing, seatbelt and child restraint use, drinking and driving, and speeding. The 10 countries involved in the RS-10 project are Brazil, Cambodia, China, Egypt, India, Kenya, Mexico, Russia, Turkey and Vietnam. IIRU is responsible for the continuous monitoring and evaluation of the road safety interventions in all 10 countries, as well as the development of training materials for local public health officials. Since early 2010, we have been working with in-country collaborators to collect baseline data on selected risk factors through a combination of roadside observational studies and interviews, focus group discussions and in-depth interviews, hospital surveillance, and household surveys.

In Mexico, for example, we have teamed with Dr. Martha Híjar and Dr. Ricardo Pérez-Núñez, experienced colleagues from the *Instituto Nacional de Salud Pública* (INSP, [Mexico's National

Institute of Public Health]), for our monitoring and evaluation work. To date we have done two rounds of primary data collection to document baseline trends of seatbelt and child restraint use in the cities of León, Guanajuato and Guadalajara-Zapopan, Jalisco. If worn properly, seatbelts reduce a front passenger's risk of dying by 40-50% and among rear seat occupants by 25-75%.<sup>1,8,9,10,11</sup> Preliminary results obtained from roadside observations indicate generally low rates of seatbelt use in both sites and abysmally low child restraint use: fewer than 10% of children were observed in some form of restraints in León as compared to nearly 15% in Guadalajara-Zapopan. Surprisingly, child restraint use is mandatory in Guadalajara-Zapopan. This situation is all the more troubling given that child restraints reduce deaths among infants by approximately 70% and among small children by 54% and 80% when properly installed and utilized.<sup>1,8,12</sup> Clearly, there is more work to be done in Mexico, and this is true of the other RS-10 countries as well.

I personally feel that such work is a major opportunity for public health professionals like myself to engage with global partners to address a real threat to the health and well being of individuals around the world. The opportunity to work with governments, international organizations, civil society organizations and colleagues from around the world is both amazing in its scope and builds on the years of experience and research IIRU has already conducted. Faculty, staff and students at IIRU are working hard to ensure that knowledge is generated to support the investments being made by governments and visionary leaders like Mayor Bloomberg. Johns Hopkins has a long and reputable history of global health engagement. We are playing a part in that process and I am delighted that we are finally attempt-

ing to combat the issue of road traffic injuries. A hope for change, hard work to ensure the use of evidence-based interventions, and persistence defines many of our projects at IIRU and at the Bloomberg School of Public Health.

*For more information visit [www.jhsph.edu/iiru](http://www.jhsph.edu/iiru) or email [iiru@jhsph.edu](mailto:iiru@jhsph.edu)*

1. Global Status Report on Road Safety: Time for Action. Geneva: World Health Organization; 2009.
2. The Global Burden of Disease: 2004 update. Geneva: World Health Organization; 2008. [http://www.who.int/healthinfo/global\\_burden\\_disease/GBD\\_report\\_2004update\\_AnnexA.pdf](http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_AnnexA.pdf).
3. World Health Statistics 2008. Geneva: World Health Organization; 2008. <http://www.who.int/whosis/whostat/2008/en/index.htm>.
4. Murray, CJ et al. The Global Burden of Disease 2000 project: aims, methods and data sources (GPE Discussion Paper No.36). Geneva: World Health Organization; 2001.
5. Peden, M et al., eds. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.
6. Jacobs G, Thomas AA, and Astrop A. Estimating global road fatalities. Crowthorne, UK: Transport Research Laboratory; 2000. [http://www.transport-links.org/transport\\_links/filearea/publications/1\\_329\\_TRL445](http://www.transport-links.org/transport_links/filearea/publications/1_329_TRL445).
7. Global plan for the decade of action for road safety 2011-2020. Geneva: Secretariat, Decade of Action, World Health Organization; 2011. [http://www.who.int/roadsafety/decade\\_of\\_action/plan/english.pdf](http://www.who.int/roadsafety/decade_of_action/plan/english.pdf)
8. Elvik, R, and Vaa, T., eds. The Handbook of road safety measures. Amsterdam, Elsevier Science & Technology; 2004.
9. Seat-belts and child restraints: increasing use and optimizing performance. Brussels, European Transportation Council; 1996.
10. Motor vehicle occupant protection facts 2006. Washington, DC: National Highway Traffic Safety Administration; 2008. <http://www.nhtsa.gov/staticfiles/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/810654.pdf>
11. Zhu, M et al. Association of rear seat safety belt use with death in a traffic crash: a matched cohort study. *Inj Prev* 2007;13:183-185.
12. Zaza, S et al. Reviews of evidence regarding interventions to increase use of child safety seats. *Am J Prev Med* 2001;21:31-37.

# The Risks of Breathing

## Targeting the Sources of Ambient Air Pollution

---

Particulate matter air pollution (PM) is a major public health problem. Numerous epidemiological and toxicological studies have linked mortality and morbidity to PM exposure.<sup>1</sup> The World Health Organization estimates that fine particulate matter (PM < 2.5 mm in aerodynamic diameter [PM<sub>2.5</sub>]) is responsible for 3% of all cardiopulmonary disease and 5% of all cancer of the trachea, bronchus, and lung worldwide, which translates to 800,000 premature

deaths per year and 6.4 million years of life lost.<sup>2</sup>

Air pollution control policies, such as the U.S. National Ambient Air Quality Standards (NAAQS), are among the principal interventions for mitigating the public health effects of air pollutants. These policies were created by

the Clean Air Act, originally passed in 1970, and were designed to control the overall levels of individual pollutants. The U.S. Environmental Protection Agency (EPA) regulates PM by the total mass of particles in the air, measured in ug/m. Initially, EPA regulated all of the particles in the air, a measure known as total suspended particles (“TSP”). As re-

search into the health effects of PM progressed, it was thought that the smaller particles were likely to be the more toxic ones because they had greater potential to penetrate deep into the lungs. EPA later changed the NAAQS for PM to pertain only to PM less than 10 ug/m in aerodynamic diameter, which is about 1/30th the diameter of a human hair. These particles were referred to as PM<sub>10</sub>. Further research found that even smaller

particles (PM<sub>2.5</sub>) were potentially more harmful and lately the focus has been on those particles. As of 2008, there is a daily PM standard set at 35 ug/m and an annual standard set at 15 ug/m. Roughly speaking, the requirements are that a county cannot go above 35 ug/m on a given day and the yearly average PM for the county cannot exceed 15 ug/m. These

two standards are intended to address the potential short-term and long-term effects of PM on human health.

One of the important challenges of regulating PM is the fact that PM is a complex mixture. For example, PM can be divided into size fractions, with the larger particles between 2.5 and 10 mm in diameter, which are referred to as

coarse thoracic PM, and smaller particles < 2.5 mm in diameter, referred to as fine PM. PM is also composed of many different chemical constituents and this chemical composition changes from location to location and season to season. The current approach to treating PM as simply a mass of particles with a certain aerodynamic diameter masks its complexity. Regulatory control of PM is hindered by an incomplete understanding of the toxicity of the mixture. Identifying which aspects of PM are most toxic has been the focus of my research as well as the goal of building a scientific basis for more targeted PM regulation to protect public health.

Current evidence suggests that the health effects of PM chemical constituents and sources are not uniform and that some constituents and sources may be more harmful than others. If this evidence is proven to be true, then finding a way to control emissions of those specific constituents and sources will provide a more effective approach to regulating ambient PM. My collaborators and I have conducted studies that reveal that both the size ranges and chemical constituents have different toxicities with respect to population health outcomes.

We have conducted national studies of the short- and long-term health effects of ambient PM.<sup>3-6</sup> In a national study of fine PM, we found very strong associations of short-term PM exposure with cardiovascular and respiratory hospitalizations. In particular, we unearthed evidence of regional heterogeneity in

---

**Identifying which aspects of PM are most toxic has been the focus of my research as well as the goal of building a scientific basis for more targeted PM regulation to protect public health.**

---

the risks, which could be related to PM chemical composition (which also varies regionally). In this study, cardiovascular effects were stronger in the eastern US and respiratory effects were larger in the western US.<sup>3</sup> In a separate study, we examined the effects of long-term exposure to PM on mortality in the Medicare population and found statistically significant mortality risks from long-term exposure to PM in the eastern and central US but not in the western United States.<sup>5</sup> Finally, we looked at the short-term effects of coarse PM (PM<sub>10</sub>) versus those of PM<sub>2.5</sub> and found that the effect of PM<sub>10</sub> on cardiovascular hospital admissions was about 3 times greater than the effect of PM<sub>2.5</sub>.<sup>4</sup> Taken together, these studies show that some regions of the U.S. exhibit stronger effects of PM than others and that the fine fraction is potentially more harmful than the coarse fraction as a trigger of cardiovascular disease.

Our more recent work has focused on examining the chemical constituents of fine PM. In a study of the short-term effects of PM chemical constituents in 119 U.S. counties, we found varying effects of seven major constituents of PM on emergency hospital admission for cardiovascular disease.<sup>7</sup> Increases in both elemental carbon (EC) and organic carbon matter were associated with increases in cardiovascular admissions. A separate study examined a larger set of chemical constituents and found that long-term levels of nickel, vanadium, and EC were associated with both mortality and hospital admission.<sup>8</sup> A number of other constituents demonstrated adverse effects, but did not reach a level of statistical significance. These studies were some of the first to provide direct evidence that different chemical constituents of PM have diverse effects and that there may be some hope of targeting the more harmful constituents. In particular, the major sources of elemental carbon



Photo courtesy of Clint Hall

and organic carbon matter are vehicle emissions, diesel, and wood burning.

Although there remain many challenges to improving the way we regulate PM and protect public health, opportunities for developing more targeted control strategies are becoming apparent. Our results for elemental carbon and organic carbon matter are an important first step and suggest that control strategies targeting their sources could be effective at reducing PM-related disease. The U.S. EPA has a lengthy and thorough process for changing air pollution regulations with numerous layers of review. Therefore, additional evidence will likely be needed before any new standards could be developed based on PM chemical composition or sources. Our work, along with the related work of others, provides a substantial evidence base upon which further research into more refined air quality control strategies can be conducted.

1. Pope CA, Dockery DW. Health effects of fine particulate air pollution: lines that connect. *Journal of the Air and Waste Management Association* 2006;56:709–742.
2. Cohen AJ, Anderson HR, Ostro B, Pandey KD, Krzyzanowski M, Künzli N, Gutschmidt K, Pope A, Romieu I, Samet JM, Smith K.

The global burden of disease due to outdoor air pollution. *J Toxicol Environ Health Part A* 2005;68:1301–7.

3. Dominici F, Peng RD, Bell ML, Pham L, McDermott A, Zeger SL, Samet JM. Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. *Journal of the American Medical Association* 2006;295:1127–1134.
4. Peng RD, Chang HH, Bell ML, McDermott A, Zeger SL, Samet JM, Dominici F. Coarse particulate matter air pollution and hospital admissions for cardiovascular and respiratory diseases among Medicare patients. *Journal of the American Medical Association* 2008;299:2172–2179.
5. Zeger SL, Dominici F, McDermott A, Samet JM. Mortality in the medicare population and chronic exposure to fine particulate air pollution in urban centers (2000–2005). *Environmental Health Perspectives* 2008;116:1614–9.
6. Eftim SE, Samet JM, Janes H, McDermott A, Dominici F. Fine particulate matter and mortality: a comparison of the six cities and american cancer society cohorts with a medicare cohort. *Epidemiology (Cambridge, Mass)* 2008;19:209–16.
7. Peng RD, Bell ML, Geyh AS, McDermott A, Zeger SL, Samet JM, Dominici F. Emergency admissions for cardiovascular and respiratory diseases and the chemical composition of fine particle air pollution. *Environmental Health Perspectives* 2009;117:957–963.
8. Bell ML, Ebisu K, Peng RD, Samet JM, Dominici F. Hospital admissions and chemical composition of fine particle air pollution. *American Journal of Respiratory and Critical Care Medicine* 2009;179:1115–1120.







# EDITORIALS

*Photo courtesy of Clint Hall*

# Connecting the Public

## Bioethical Issues in Popular Medical Dramas

---

Due to the growing popularity of medical dramas in film and television, the general public is increasingly exposed to a wide variety of bioethical issues. As people watch these shows, they are presented with ethically questioning situations that professionals, policy makers and many citizens face every day. Although they were once only discussed in the sphere of academia, bioethics related issues are now being brought to the table of the general population, and it is important that a framework is established in which a free exchange of ideas can be easily coordinated. An educated populace will be necessary to contribute valuable opinions to the many bioethical issues that are only growing in importance as life sciences continue to evolve. And the key to cultivating an adept public base is to increase awareness of the many medically and ethically relevant problems that arise with modern healthcare and clinical research, while also allowing for a forum for discussion in order to address those problems.

One way to draw people into these dialogues is to use familiar media outlets, such as popular television shows, as the groundwork for the future merging of other tools that can be used to bring about conversations on bioethics. Senior Research Coordinator at the Johns Hopkins Berman Institute of Bioethics Alan Regenberg describes his views on the new avenues of reaching the public. “The portrayal of medical ethics and professionalism issues in TV medical dramas is very intriguing terrain. There’s an interesting circularity to it, in that the issues and how they are portrayed both

reflect and influence current realities in practice. There is much to be learned from these vignettes.” Together with Mr. Regenberg and other Berman Institute staff, I set out on a task that involved selecting, watching, cutting, and finally uploading various television media clips to an organized online database.

Even while the idea of providing a website that could combine television and bioethics was still in its early phases of planning and development, it was postulated that the Johns Hopkins Berman Institute of Bioethics could supply such a resource through which it can augment its already popular ‘Bioethics Bulletin’ website by adding a new site that specifically targets bioethics in television entertainment (or BITE). Found at [www.bioethicsmedia.org](http://www.bioethicsmedia.org), we as Berman Institute staff are hoping that this expansion will draw more traffic to the website by providing a new, interesting outlook on issues in the modern practice of life science research and medicine. In addition to the daily updating of bioethics related news articles posted to the Berman Institute home webpage, the website has expanded into the realm of television to provide visitors with the opportunity to view clips coded and organized by the issues to which they pertain.<sup>1</sup>

To shape the initial collection of media clips, five of televisions’ most popular medical shows were chosen with anticipation of expansion after the initial launch of the database and forum. These consisted of both Primetime Emmy and Golden Globe winning dramas including *House, MD*, *Grey’s Anatomy*, *Nurse Jackie*, *Mercy*, and *Private Practice*.

A research assistant reviewed each episode for the appearance of any one of an expansive list of bioethical issues cited by the Berman Institute as possible points of ethical contention. From there, the clips selected were cut and sorted to allow for easy port into the online database. An example of a coded clip would be in an episode of *House, M.D.*, specifically Season Six Episode Four (named “The Tyrant”).<sup>2</sup> The episode showcases a patient who happens to be an African warlord/dictator who coerces one of his citizens into donating needed blood that would help treat one of his symptoms. Is the physician morally wrong for accepting a coerced donation of blood if he was a witness to the intimidation? These are the types of thinking questions the Berman Institute are hoping to bring to the table for the public, along with giving them a place that is easy to navigate and where they can respond and give their opinions.

With each show spanning several seasons, it became a daunting task to separate out relevant clips within each episode; this was aided by the development of an intuitive classification system developed by the bioethics library at Georgetown University’s Kennedy Institute of Ethics.<sup>3</sup> In a nutshell, numbers were assigned to each bioethical issue that the institute thought would be a good public discussion topic. Popular issues included the professionalism of doctors, treatment of death and the terminally ill, the use of developing science/technologies on humans and animals and their influence on societal policy making. In addition, these clips could



*Photo courtesy of Komal Kumar*

be tied back into the already existing infrastructure on the Berman Institute website, consolidating all information on similar bioethical problems regardless of how they were presented. For the public, this means that search engines could intuitively connect someone to the bioethical issue they wish to research by granting access to a database containing news articles, research publications, and media clips that can all be reviewed and discussed on an integrated and interactive web resource.

Now in its beta-launch stages of development, the website is online and being populated, debugged, and refined. We hope that the additions to the website

will occur steadily throughout the upcoming few months with a fully operational product finished by the conclusion of this school year. From there, we can only hope that the increased accessibility and ease of sharing of information will allow the Berman Institute of Bioethics to play its role in planting seeds of education in a public that to some degree is unaware of problems that only expand as society moves forward in scientific research and application. The central goal has always been and will continue to be providing a user-friendly system in which the general populace can begin to examine these issues for themselves. With this forum, we think people will be

able to form more learned connections to those issues that have effects on their own lives and in social norms.

1. Berman Institute of Bioethics: Bioethics in Television Entertainment Website. Available at: <http://bioethicsmedia.org/>. Accessed December 7, 2011.
2. Straiton, D. (Director), Shore, D. (Producer). "The Tyrant." House M.D. United States: Shore Z Productions; 2009.
3. The Bioethics Research Library at Georgetown University Website. Available at: <http://bioethics.georgetown.edu/>. Accessed on December 7, 2011.

# The Kids Are All Right

## What the children of a South African township taught me about living with HIV

---

If you had asked me six months ago to describe an HIV-positive child, I would have given you an image ripped straight from the movies: a frail toddler with sad eyes, lying on a hospital bed, desperately awaiting medical attention. If you had asked me about the causes and effects of HIV/AIDS on impoverished young people, I would have spouted well-established facts on mother-to-child transmission and the relationship between poverty and adverse health outcomes. And if you asked me what was being done to help children affected by this devastating disease, I would have pointed to several prevention programs and NGOs aimed specifically at infected youth. But what did I really know about the life of an HIV-positive young person? My understanding of the global epidemic was based largely on what I learned in class or saw on TV. I had never met anyone with HIV, and I hadn't the slightest clue how their disease status affected even the most mundane aspects of their day-to-day lives.

I remained confident in my narrow perspective upon arriving in Cape Town, South Africa last summer for my six-week study abroad experience. As part of my Community-Based Learning course, I was offered an internship at Ubuntu Africa (UBA), a non-profit dedicated to providing comprehensive care programs to children with HIV/AIDS. UBA is located in the sprawling township of Khayelitsha, which is home to as many as one million people. While Khayelitsha may only be a half hour's drive from

downtown Cape Town, it might as well be in a different country altogether.

Drive down the N2 highway and the comfortable, affluent suburbia outside South Africa's second largest city quickly turns into a vast sea of shacks and unmarked streets. Whereas Cape Town and its surrounding neighborhoods are virtually indistinguishable from a prosperous Western metropolis, Khayelitsha is the picture of poverty. Crime is a fact of everyday life and unemployment rates are at a staggering 28%. People lack access to nutritious food, indoor plumbing, and health facilities. Deficiencies of resources, low levels of education, and the pervasive stigma attached to diseases mean that Khayelitsha's HIV-positive population is left to suffer alone. It is no wonder, then, that the township's children bear an especially heavy burden of disease and social isolation.

This is where UBA intervenes. In order to address the health needs of the township's HIV-positive children, the organization focuses on five key areas: healthcare, social work and counseling, nutrition, confidence-boosting activities, and education. Its staff includes cooks, a social worker, an educator, a nurse, and a constant stream of volunteers and interns, all of whom are dedicated to creating a wholesome, welcoming, and empowering environment for Khayelitsha's kids.

One of my first tasks at UBA was to work with the organization's nurse and social worker to compile data on the children's health status and social condi-

tions, information that would later be used to create the organization's Management and Evaluation (M&E). The data we amassed pointed out the obvious: UBA's HIV-positive children enter the program severely malnourished, suffering from opportunistic diseases like tuberculosis, and beset by mental and behavioral problems that affect their academic performance.

However, the numbers on my simple Excel spreadsheet exposed even more unsettling issues. Some of the children suffer from depression, are victims of sexual and physical abuse, and lack a stable family life. Many live with extended family or foster parents, and very few come from two-parent households. From speaking with the staff, I also found out that a few of the children did not even know they were HIV-positive when they first entered the program. Their parents were too afraid and ashamed to reveal it or were in denial about their own disease status. A handful of UBA's children were AIDS orphans – children left parentless through death or abandonment. With mother-to-child transmission accounting for 90% of childhood HIV/AIDS cases in Sub-Saharan Africa,<sup>1</sup> young people are faced with the lasting psychological scars of losing one or both parents to AIDS. South Africa is predicted to have 2.3 million AIDS orphans by 2020.<sup>2</sup>

AIDS orphans and HIV-positive young people face a daily battle against stigmatization and social isolation that accompany their disease status. In townships where levels of education are



*Photo courtesy of Jason Oh*

uneven, HIV/AIDS is sometimes seen as a blight upon the community. Consequently, many HIV-positive young people are ostracized and refuse to seek treatment for fear of further ridicule. The disease status of a child is often a topic of malicious gossip, especially if the child's parents have been diagnosed with HIV or have died of AIDS, leading to feelings of insecurity and a constant fear of judgment. The threat of discrimination keeps children and adolescents from disclosing their health status beyond immediate family and caregivers,<sup>3</sup> narrowing their chances of receiving adequate care and support. HIV's detrimental social effects on children and adolescents severely impede their ability to form healthy relationships with their peers and with their community, worsening both their emotional and physical health.

Although the antiretroviral (ARV) regimen needed to treat HIV is available in the township, accessing it presents

a host of obstacles. Children must rely on parents or caregivers to take them to clinics, which is difficult when these adults have inconsistent work schedules and lack cars or other means of transportation. Just getting to those clinics is a time-consuming ordeal, requiring children to take even more time off of school. Their frequent absences often signal their disease status to other students, inviting ridicule and malicious gossip that further degrade their self-esteem.<sup>4</sup>

The reality behind the numbers was grim and foreboding. My otherwise harmless Excel spreadsheet painted a hopelessly bleak picture of these chil-

dren's lives. While I had always known that poverty exacerbated poor health outcomes, I never really understood how multi-faceted and pervasive that

---

**On paper, these children seemed pitiful, frail, and beaten down by life. In reality, I was happy to find, they were anything but.**

---

interrelationship could be. Those kids I read about in textbooks, the ones I saw on TV and in documentaries – they were no longer academic case studies or heartbreaking one-dimensional images. They were in the flesh for the first time, right in

front of me.

On paper these children seemed pitiful, frail, and beaten down by life. In reality, I was happy to find, they were anything but. Not a single one of the kids I met at UBA fit my naïve preconceived

image of an HIV-positive child. On the contrary, they appeared so healthy, boisterous, and optimistic that I nearly forgot they were suffering from anything at all. Of course, this is due in large part to UBA's efforts. Whitney Johnson, the founder and Executive Director of UBA, knew that she needed to address the social, environmental, and psychological obstacles that stood in the way of achieving full physical health. That is why UBA plans self-esteem boosting exercises and field trips, provides counseling for children and their families, and educates the children about HIV/AIDS and ARV treatment to fully involve them in the prevention and treatment process. The staff closely monitors their treatment adherence, ensuring that they have access to ARVs in the first place. Most importantly, UBA provides stability and a reliable source of care and support, both of which are severely lacking outside the walls of the organization's tiny home base. It is no wonder, then, that the organization's membership has expanded exponentially over the last few years and will continue to do so as its capacity and resources grow.

Now when you ask me to describe HIV-positive youth, I will tell you that they are just like normal kids: playful, enthusiastic, curious, and optimistic. When you ask me about the causes and effects of HIV/AIDS, I will point to aspects of their day-to-day lives that one often overlooks in favor of bigger social and economic problems that plague the poor. And if you ask me what should be done to improve the situation, I will refer to UBA's model and cite the need for more comprehensive care programs that will address all facets of a child's mental and physical health. This experience has deepened my understanding of HIV/AIDS and led me to realize the importance of getting out of the classroom in order to inform myself of the

reality surrounding a much-talked about, but seldom-observed, situation. As UBA and its children grow, I have no doubt that they will become vocal advocates for South Africa's HIV-positive, both big and small.

- 
1. Petersen, I., Bhana, A., Myeza, N. Psychosocial Challenges and Protective Influences for Socio-Emotional Coping of HIV. *AIDS Care*. 2010;22:970-78.
  2. Cluver, L., Gardner, F., Operario, D. Psychological Distress Amongst AIDS-orphaned Children in Urban South Africa. *Journal Child Psychol and Psychiatry*. 2007;48.8:755-63.
  3. Petersen, I., Bhana, A., Myeza, N. Psychosocial Challenges and Protective Influences for Socio-Emotional Coping of HIV. *AIDS Care*. 2010;22:970-78.
  4. Richter, L. The Impact of HIV/AIDS on the Development of Children. A Generation at Risk? HIV/AIDS, Vulnerable Children, and Security in Southern Africa. *Institute for Security Studies*; 2004:9-31.

# Holding Hands with Angels

Is it by choice or circumstance that we are born where we are?

Last spring, I studied abroad in Nairobi, Kenya through a program run by SIT—the School for International Training. Part of our semester curriculum allowed us to design and carry out independent field research. My research allowed me to work with Angels of Hope-Kibera, a free school in the slums of Kibera that supports over forty children affected by AIDS.

Kibera is one of the largest slums in the world, and the biggest in East Africa, with over a million people living in the square-kilometer settlement. A bird's eye view of the slum reveals a cinnamon-red mass of rickety huts and roofs piled on top of one another. Trash lines the train tracks, the banks of the river, and the tiny crevices that separate people's houses. When the rain falls, it pours, and the next day a slick and muddy swamp replaces the narrow dirt pathways that wind through the huts.

The AIDS epidemic on this community has exacerbated the current situation. In Kibera, as much as 20 percent of the population is HIV-positive.<sup>1</sup> With such a high prevalence rate, there are then many families, friends, and loved ones who become affected. Sustainable income, good health, and decent livelihoods are already hard to come by, given the current political and economic situation; those affected by HIV/AIDS within the slum are subject to even scarcer resources. With the addition of the cruel stigma and psychosocial damage attached to HIV, another dimension of the struggle becomes apparent.

Children in sub-Saharan Africa are especially affected by this epidemic: in

2009, 16.6 million AIDS orphans lived in the region.<sup>2</sup> Millions more have parents or other family members living with the disease. The situation in Kibera is particularly dismal, with AIDS-affected children facing diminished household income, inability to attend school, psychosocial problems, violence, and economic exploitation, such as child labor and sex work.<sup>3</sup>

---

**With the addition of the cruel stigma and psychosocial damage attached to HIV, another dimension of the struggle becomes apparent.**

---

However, there is progress and hope for these kids. Foreign aid, donor funds, NGOs, and humanitarian relief organizations have done much to alleviate the plight of children and others touched by HIV/AIDS. But a major agent of change—and the one deemed by experts to be the best solution in helping AIDS-affected children—are grassroots organizations supported by external operations.<sup>4</sup> Not only do these institutions know the intimacies of what ails their communities, but they also have the trust and respect of those they serve by acting as the medium through which action occurs. Angels of Hope-Kibera (AOHK),

the school that I worked with, is one of these institutions.

AOHK was founded in July 2010 by an amazing young woman native to Kibera. At just twenty-two years old, Regynah Awino started this school that today enrolls more than forty AIDS-affected children. AOHK is vital in its support of these kids because of its ability to give them a space where they can live, grow, and be shielded from the daily stresses that Kibera and HIV/AIDS have laid upon them; the school serves as a much needed escape from the struggle that goes on at home. AOHK's services include early childhood education, a daily feeding program, psychosocial counseling, and assistance in acquiring ARV drugs—all at no charge. With its humble staff and focused dedication, AOHK and institutions like it are actively putting a dent into the HIV/AIDS epidemic that has devastated communities in sub-Saharan Africa for decades.

But, despite the success of these organizations in tackling the AIDS epidemic, their impact is limited by a common drawback: funds. AOHK is no exception. The dilapidated building that houses the school is a rented-out church. It is dimly lit, and the iron-sheeted roofs and walls are full of holes that allow for flooding. Emergency funds are non-existent. One child last year died from an easily treatable asthma attack; the school did not have the money on hand for the hospital fees. The quality and breadth of services can always be expanded to allow AOHK to support more kids with better care.

This is the picture that inspired me to act: a school worthy of being invested

in, of effectively achieving its mission in reducing the impact of HIV/AIDS on children, but being held back only by bits of paper. The question was never if I would try to help AOHK, but how. It was a challenge to come up with a fundraising concept, but after consulting with various friends and advisors, I haphazardly proposed to Regynnah the idea of a photobook: a book for sale that documented pictures of the children and the poignant stories that I would hear after interviewing their families. I did not know how effective it would be at generating revenue, but I was enamored with the idea of giving potential supporters something hard and tangible, evidence that could be touched and held to prove that the beautiful kids they were supposedly helping were indeed real.

So I set out with Regynnah to hike all over Kibera to the children's homes, my Nikon in tow, along with what little Swahili I could speak and the few photography skills I had. With Regynnah translating, I was told vividly painful stories by mothers, father, grandmothers, caretakers, and aunts. More than anything, the discussions with these families were what transformed this endeavor from a side project to something that needed to succeed—the stories were too harshly real for it to fail. By photographing the children candidly and combining those pictures with narratives I wrote from the family interviews, the photobook—fittingly entitled *Faces of Angels*—was complete by mid-July. Five months later, and after various speaker events, fundraising drives, and the production of another photobook (called *Under the Red Bandana*), over 1,000 dollars had been raised, with totals edging closer to 2,000. Though this might seem like very little to support an organization, eight of the elder kids, too old for early childhood education, have been sent to government-sponsored schools with some of

the funds generated, and the rest continues to support AOHK on its original 8 dollars per child per month budget.

Nonetheless, people continue to argue about the purported sustainability of such small-scale initiatives. They question how grassroots institutions can possibly see themselves live for more than a year with a constrained and uncertain economic base. But thoughts of sustainability fall to the wayside once the tiny, tender fingers of these kids pry their way into your own. Who is to say that donated funds do not sustain someone worth helping when that someone is holding your hand?

The topic is a sensitive one, but what constitutes an adequate level of financial stability that is then deemed “sustainable” differs by point of view. Many of those in charge of running community-based organizations within developing countries have managed to subsist despite skimpy budgets and frequent setbacks. It is probably a testament to the strength fortified from the hardships faced that creates the resilience to survive and operate despite inherent complications. It is a further testament to that resilience that, once funds and support become available, these institutions thrive. AOHK was not in the best of shape when I first saw it, but now it appears to be better than ever with the little that I have managed to scrape up for them.

When I think about the work that I continue to do for all of those kids back in Kibera, I recall the words quoted at the very top of this article. Is it by choice or circumstance that we are born where we are? I came across them while scanning the Facebook page for AOHK, and it sums up the tragedy of the situation of these kids. Obviously, these children did not choose to be born in Kibera—to mothers, fathers, and family suffering from HIV/AIDS. Nor is their

birth to life in the slums an unavoidable circumstance of their conception. The question ultimately serves as a paradox, since only chance really determines the place we are born into. And that is the thing that troubles me most: how random probability has gifted me with an easy life full of First World comforts, while simultaneously handing adversity and hardship to my little brothers and sisters in Kibera. Something as uncontrollable as chance is what dictated our very different lives, creating an extremely unfair reality. This is why supporting AOHK is so important to me. It gives me an opportunity to rectify the injustice cast upon these innocent kids who did nothing to be in the situations they are in. My work allows me to help create a future that these children were not born with, but no less deserve.

- 
1. Berlin, L. *Loaning Health: The Effectiveness of Microfinance as an HIV/AIDS Intervention Method in Kibera Slums*; 2006. ISP Collection. Paper 336.
  2. Joint United Nations Programme on HIV/AIDS (UNAIDS). *UNAIDS Report on the Global AIDS Epidemic*; 2010. UNAIDS; 2010. Available at: [http://www.unaids.org/globalreport/global\\_report.htm](http://www.unaids.org/globalreport/global_report.htm)
  3. Togom, D. Bachelor's thesis: *Challenges Facing AIDS Orphans in Nairobi Kibera Slums*. Turku University of Applied Sciences; 2009. Available at: [http://publications.theseus.fi/bitstream/handle/10024/5782/Togom\\_David.pdf?sequence=1](http://publications.theseus.fi/bitstream/handle/10024/5782/Togom_David.pdf?sequence=1)
  4. CRS Report for United States Congress. *AIDS Orphans and Vulnerable Children (OVC) Problems, Responses, and Issues for Congress*; 2005. CRS Report for United States Congress; 2005.



# South Africa and Its Natives

---

Never before had I envisioned Africa as “cold,” but one of my strongest memories of working with Kheth’Impilo, an NGO in Cape Town, South Africa, was the chilly wind that hissed through the open windows of the public clinic at Wallacedene. Along with attempting to ventilate the crowded waiting rooms as much as possible, this government-run health center also mandated that all patients and workers wear paper masks while inside. Both of these precautions helped to prevent the spread of *Mycobacterium tuberculosis* in the air, making it harder for patients to acquire tuberculosis from their infected neighbors in the room. I realized that the paper masks represented a common feature that all of us, black or white, wealthy or poor, shared within the walls of the clinic.

As one weary-looking patient after another dragged themselves through the examination room door, I often found myself more curious about their lives outside the clinic than the diagnosis the nurse would give them. Was this man upset about needing to miss four hours of work to wait in line to see a nurse for ten minutes in order to refill his AIDS medication? Did this young woman with her infant tied to her back with a towel have other children and family members, or were she and her daughter alone in Wallacedene? Was this teenage boy ashamed of the events that resulted in his positive HIV test result? What became of each patient after they left the clinic and returned to their everyday lives, I could only speculate.

The nurse diagnosed a middle-aged man with kidney failure and called for an ambulance. Ten minutes, twenty

minutes, and then an hour passed, but no ambulance arrived. The man sat perched on a wooden bench, evidently weak, but calm. He did not appear to be panicking about the fact that his kidneys were quickly failing with no emergency vehicle in sight. I realized that if I were in his position, I would be wringing my hands in distress, shaking all over, crying, pleading to know why help had not yet arrived. Two hours later, a van finally arrived outside the clinic. Once the man, still perfectly calm, had been safely loaded into the van, I asked the nurse why it had taken so long for the ambulance to arrive. He replied that this vehicle was one of very few serving a very large area surrounding Wallacedene, and that waiting more than an hour for its arrival was typical. It struck me that the vehicle’s “emergency” function was undermined by the lack of available transportation in the region.

South Africa’s health systems need to be restructured—there is much evidence of that beyond what I can illustrate here. But the daily challenges facing its citizens include more than difficulty obtaining the appropriate health care. In addition to Wallacedene, my experience of Community-Based Learning in South Africa introduced me to another unforgettable community—Zwelethemba. Spending a weekend in this town was memorable for me for many reasons, but Sinethemba, our homestay mother’s twenty-two-year-old niece, will always be my most vivid memory from Zwelethemba. Sinethemba, a spunky and outspoken young woman, struck me as a person that I might just as easily have met in the United States—but the insight

she shared allowed us to see just how South African politics impact its people.

She claimed that although the government has made an effort to help raise South Africans’ standard of living, there is still much work to be done. Residents of Zwelethemba are fortunate to have access to a small library and a public daycare center, but most of the roads connecting the community are unpaved; vehicles kick up dust, sand, and small rocks wherever they travel. Sinethemba expressed her frustration with the fact that people from other southern African nations come to Zwelethemba during several months of every year to work for very low wages, wages on which Zwelethemba residents cannot survive. These foreign workers take their money back to their families, returning a few months later to work again. The government has too much on its plate to even attempt to prevent foreign workers from disturbing the job market. Sinethemba said that this issue is fueling a high unemployment rate in Zwelethemba, since competition for jobs is fierce, and the demand for labor drives wages down until only foreign laborers can work. The unemployment rate in South Africa stands at about 25%, a devastating percentage that the United States has not experienced since the Great Depression.<sup>1</sup>

Sinethemba insisted that the neighborhood where we were staying for the weekend was not representative of where the poorest people lived, and suggested that we come with her that afternoon to visit the pigsty. I found her opinions strong, but well-supported, and her invitation intriguing. We left our house and trudged along sandy path-



*Photo courtesy of Michael Dawedeit*

ways for about fifteen minutes before we reached the grassy valley on the outskirts of Zwelethemba. I saw no houses or structures built in the valley—just piles of trash strewn everywhere. I would hesitate to call this area a garbage dump or a landfill, because it obviously was not organized or regulated at all. It seemed that people passing by threw in whatever they happened to be carrying, and large plastic bags overflowing with garbage were lying everywhere. Amongst the piles of trash, goats and chickens grazed on bits of discarded food, and small children played in a patch of bare dirt, an island in this ocean of waste. Sinethemba pointed to these youths, and declared that it was not safe or healthy for them to be playing there. Realizing that children were playing in this trash heap horrified me, but I could think of nothing to say in response.

We ventured past the valley of garbage, and reached an area where pigs and piglets huddled in small wooden pens, gorging themselves on buckets of slop. In between these pigpens, tiny shacks and outhouses had been built. This was clearly where the poorest of the poor lived in Zwelethemba. The smell of the pigsty was almost unbearable, giving me sympathy for the people who lived in the vicinity. Obviously, no one dwelled here

by choice.

From the pigsty, Sinethemba led us to a very small community center for children that had recently been built by a donor from South Korea who was living in town for a few years. The one-room structure was well-built, but miniscule, roughly half the size of an American classroom. Sinethemba, who volunteers at the center, told us that there is only room inside for about twenty-five children, and that the waiting list for those who want to attend is long. She said that the community wants to expand the center to be able to include more children, but lacks the funding. It was striking to me that Zwelethemba's population of youth has grown so rapidly that, despite the public daycare and this community center, resources for children are still in short supply.

I was stunned by how much more appreciative I was for American waste management systems and childcare programs after spending one hour touring the community with Sinethemba. I often take both of these entities for granted at home, yet when I saw the tremendously lower quality of life that persisted here, I realized just how important it is for a country to handle its citizens' trash and care for its youth. This sobering lesson is one that I will always be grateful to

Sinethemba for giving me. I will never forget that day when she led me on a tour that will stay with me for the rest of my life.

Sub-Saharan African communities like Zwelethemba and Wallacedene are struggling, but it is not impossible to help raise them from poverty. Initiatives like Kheth'Impilo are working to improve health care in South Africa by providing resources and services for public clinics when their government support falls short of what is necessary. Private donors like the gentleman from South Korea are boosting the standard of life in rural communities where government assistance is not as effective as it ideally would be. From my experiences in South Africa, I believe that the most useful intervention is to identify which non-profit organizations and programs are making the greatest difference for citizens, and then to expand these programs to increase their impact. Good intentions are alive in the nation, and the next logical step to take is to amplify those intentions to enrich South African society with positive changes.

- 
1. South Africa Unemployment Rate. Index-Mundi. 2011. Available at: [http://www.indexmundi.com/south\\_africa/unemployment\\_rate.html](http://www.indexmundi.com/south_africa/unemployment_rate.html). Accessed March 19, 2012.

## ACKNOWLEDGEMENTS

*Epidemic Proportions* would like to thank the Public Health Studies Program, the Krieger School of Arts and Sciences, and the Johns Hopkins School of Public Health for making this journal possible.

We would like to extend our appreciation and recognition to:

President Ronald J. Daniels

Deans Katherine Newman and Steven David at the Krieger School of Arts and Sciences

Deans Michael Klag and James Yager at the Bloomberg School of Public Health

The members of the Public Health Studies Advisory Board: Richard Cone (Chair), Gregory Ball, Andy Cherlin, Adam Sheingate, Jim Tielsch, John Groopman, Marie Diener-West, Ellen MacKenzie, and Ms. Rose Zulliger

The members of the Krieger School of Arts and Sciences Public Health Studies Program: Kelly Gebo, Director, James Goodyear, Associate Director, Lisa Folda, Academic Advisor, Mieka Smart, Academic Advisor, Ann Beckemeyer, Administrator, and Ali Rieck, Administrative Assistant

The faculty members and supporters of student research

## FEEDBACK

Please send your advice, criticism, and other thoughts to the Editors at [ep@jhu.edu](mailto:ep@jhu.edu).



# MEET THE STAFF

## EDITORS-IN-CHIEF

Sheerin Habibullah

*Class of 2012*

Pujan Dave

*Class of 2013*

## RESEARCH

Julia Zhang, Section Editor

*Class of 2013*

Natasha Seelam

*Class of 2013*

Pavitra Gudur

*Class of 2015*

Meera Ramakrishnan

*Class of 2013*

## PRINCIPLES & POLICIES

Kevin Chun, Section Editor

*Class of 2012*

Jessica Debakey

*Class of 2013*

Daniel Borota

*Class of 2014*

Lauren Lipshutz

*Class of 2015*

## FEATURES

Sanjoli Sur, Section Editor

*Class of 2013*

Adelina Huo

*Class of 2013*

Ashley Millette

*Class of 2014*

Sharif Braxton

*Class of 2012*

## PERSPECTIVES

Sangeeta Ramani, Section Editor

*Class of 2013*

Diana Thomson

*Class of 2015*

Sindu Ravi

*Class of 2013*

## EDITORIALS

Eric Luitweiler, Section Editor

*Class of 2013*

Roger Henry

*Class of 2013*

Jane Wang

*Class of 2015*

Jessica Salama

*Class of 2014*

## LAYOUT & DESIGN

Elle Pfeffer

*Class of 2015*

Matt Yang

*Class of 2014*

## SECRETARY

Brian Ho

*Class of 2013*

## TREASURER

Diana Liao

*Class of 2013*

## WEBSITE & PUBLICITY

Alane Lim, Chair

*Class of 2013*

Benjamin Tsoi

*Class of 2015*

# NOTES

# NOTES



*Epidemic Proportions*  
Johns Hopkins University  
Baltimore, MD  
Vol. 9, Spring 2012