



# Northwestern Public Health Review

*Public Health Matters*

*Fall 2013*



## About the Cover

This issue's cover art has a long and not entirely flattering history. To be entirely honest, there is a creepy little attention seeker inside of me that simply craved the profane pleasure of driving home from school with a human skeleton riding shotgun. While it's true that preparing this composition provided myriad perverse delights, the governing impetus to create a life-size rendering of the skeletal system dates back to the beginning of my senior year of high school, when I chose to build my AP art portfolio around the theme "Flesh and Blood."

This piece represents my attempt to discuss the physiological implications of this idiom: flesh and blood, an interest that grew out of my profound regard for the human body. I have always loved looking at humans, looking closely; the deeper I go, the more fascinating they become. However, I think that the way we view our insides needs a PR makeover. Historically, the imagery surrounding our flesh and blood has been alienating, due either to unsettling gore or academic sterility. We've been offered *memento mori* or anatomy theatre, slasher porn or textbooks. The result of that conditioning is an unnecessary squeamishness. We're taught to "love ourselves" but we tend to balk at the nuts and bolts of how we actually



work. Talk about a body image issue. I believe loving yourself includes loving your own *gross-ology*.

I aim to demystify and revel in not only the workings of the human body, but also in the active study of it. In a time when looking at the inside of a person doesn't require their violent demise, I encourage people to look inward in a very literal sense. As I have been reminded by every art history class I have ever taken, imagery is a powerful force in establishing an idea. I want

people to love themselves, so I try to contribute to a canon of images that speaks to the fundamental beauty of the body.

They say the best way to become comfortable in your own skin is to spend more time naked. So this is me making us all a little more naked and a little more beautiful. Admittedly this goal is a little lofty, but I am passionate about

accustoming people to the idea that their bodies are not just points of sale, not just casings. Spirit gone, man is not garbage. We are not garbage. We are flesh and blood.

Meghan McCarter

*Meghan McCarter is an undergraduate at Northwestern University and the artist of this edition's cover of the NPHR*

# Letter from the Editors

We are incredibly thrilled to welcome you to the inaugural edition of the Northwestern Public Health Review (NPHR). The NPHR was created to provide a platform for students, alumni, professors, doctors, and residents at Northwestern to communicate public health news, projects, histories, and opinions to the Northwestern public health community.

The public health community at Northwestern is diverse. It encompasses faculty and students from the medical school, business school, law school, engineering school, and more. Our objective is simple: to stimulate interdepartmental public health discussion and the cross-pollination of ideas.

Historically, Northwestern has been deeply engaged in public health innovations, from identifying salt as a cardiovascular disease risk factor to managing and caring for the earliest HIV patients. Even today, Northwestern faculty and students continue to push the boundaries of public health care in the U.S. and around the world. Our hope is that this publication will serve to highlight these public health efforts.

When the NPHR was first envisioned, one question persisted: “there are a lot of public health reviews out there—what’s the need for another one?” The answer is that the NPHR provides a *behind the scenes* look at the story of public health at Northwestern and in the wider world—the story behind the story.

In this inaugural issue, we strive to do just that: take you behind the scenes of how public health works and why public health matters. Specifically, we explore the operations of the Illinois Department of Public Health, the creation and evolution of the Framingham heart study, the earliest recorded HIV cases in Illinois, and the potential implications of recent budget cuts to mental health care in the state. Finally, we share research, reflections, and introspections from eminent Northwestern faculty and students, past and present.

Although this journal started out as a small idea for a web-based publication, it has taken on a life of its own, and there are many people to thank for this. First, we would like to thank Dr. Rebecca Wurtz and Dr. Rahul Ganatra, who both worked tirelessly to conceptualize the purpose and framework of the NPHR.

We also want to thank Dr. Anna Fenton-Hathaway and Carolyn Silva for their editorial and technical support.

We are deeply indebted to the Program in Public Health and The Graduate School of Northwestern University, whose catalyst grant and financial support made this project a reality. We also want to thank Dr. Donald Lloyd-Jones, Dr. Steve Anderson, Katie Watson, and Dr. Anagha Loharikar for their constant guidance and unwavering support and commitment. Lastly, we would like to give special thanks to all of the contributing authors and artists who have breathed life and substance into this inaugural issue.

We hope you enjoy reading it as much as we have enjoyed working on it.

Sincerely,

Celeste Mallama and Osefame Ewaleifoh,  
*Founding Editors NPHR*



Artwork by Meghan McCarter

## Inside the Framingham Heart Study

*As a cardiology fellow at the Massachusetts General Hospital, Dr. Donald Lloyd-Jones started working at the Framingham Heart Study (FHS) and continued as a staff investigator for 6 years. During his tenure, FHS transitioned from the 20<sup>th</sup> century's foundational epidemiologic study of cardiovascular disease to the "Framingham Study" of 21<sup>st</sup>-century chronic disease. Recently, Dr. Lloyd-Jones recorded some of his impressions of working with the study, from the role FHS has played in shaping disease prevention to his experience with the participants. Dr. Lloyd-Jones is currently the chair of Preventive Medicine at Northwestern.*

*This article was compiled from an interview with Dr. Lloyd-Jones by Dr. Rebecca Wurtz.*

I probably first heard about Framingham during our cardiovascular unit in the first year of medical school, but it wasn't until I was choosing my research project as a second- and third-year cardiology fellow, and was invited out to Framingham to visit the study's office, that I seriously thought about working there.

On my first day in Framingham, Bill Kannel [*the legendary director of the FHS*] came into my office, plunked down next to me, and reeled off 10 solid gold projects that he just had never had time to do. He knew the data better than anybody—he had been there forever, and he was brilliant. Literally, my mouth was hanging open as I was listening to

these amazing ideas for projects. That's the kind of place it is. Mentoring and scientific inquiry are of paramount importance. To be exposed to the study as a fellow, with the tremendous strengths of the mentors and the scientists there, as well as an extraordinarily rich data set, was a tremendous experience.

I was really lucky to get in at the front end of the first study to look at lifetime risks for cardiovascular disease. We trailed our cancer epidemiology colleagues—they recognized the power of understanding long-term risk as a messaging tool, and had used it to good effect to motivate breast cancer screening. But Framingham was one of only a handful of places that could look at this. The combination of long-term data and perspective with novel methodology is a theme that runs throughout Framingham's history.

*“I was really lucky to get in at the front end of the first study to look at lifetime risks for cardiovascular disease.”*

The study is an amazing environment. For the first 30 years, FHS was headquartered in a house down the street from the local hospital. When I started, the study was housed in a convent building behind the local Catholic high school, where they were for about 20 years. A religious brother still lived there, and you'd bump into him in the hallway sometimes. Now the study is located in a modern office building, but it is still right downtown in Framingham, Massachusetts.

The fellows do the periodic exams of cohort members, so we got to know the participants really well. They are lovely people. The original cohort members still come back. The

study started 64 years ago, so many of the members who started in middle age have died. But there were participants as young as 28, so a few original participants are still hanging in there. It turns out they were the ones who maintained their healthy habits!

The original sample was almost a random sample of the residents of Framingham. One thing that's been misunderstood about Framingham is that, while the population of the town in 1947 was exclusively white and therefore the cohort is racially quite uniform, participants came from all social classes. There were gentleman horse farmers, managerial people, and blue-collar employees from the mills. So it was socioeconomically quite diverse, if not racially.

The people of Framingham had previously participated in and benefitted from a population study of the diagnosis and treatment of tuberculosis in the 1920s, so town officials, Boston doctors, and the local congressman lobbied to have the heart study sited there. About half the people in the town, 5209, were enrolled in the original cohort, including 1644 spouse pairs and members of 596 extended families. The original cohort has been examined every two years since the study began. The follow-up “Offspring Study,” initiated in 1971, included 5124 people; almost 70% were biological offspring of the original cohort. Members of the original and offspring cohort—who often live in places like Arizona and Florida now—continue to travel to Framingham at their own expense for their study-related exams. They have a fierce loyalty to the study and a great understanding about what they have contributed to the world through their participation.

The Gen3 study has 4095 members, grandchildren of the original cohort, and focuses heavily on genomic data collection. When the study was recruiting for Gen3, members of the second cohort called to insist that their children be included, and ultimately the size of the cohort was larger than anticipated because so many people insisted that family members be included. “If you don’t take my children for the Gen3 cohort, I’m going to be angry. Dr. Kannel is my friend, and...”

*“They have a fierce loyalty to the study and a great understanding about what they have contributed to the world through their participation.”*

Framingham was such a good investment. By 2000, there had been more money spent on the Kenneth Starr investigation of Bill Clinton than on the entire history of Framingham. It’s gotten more expensive since then with the addition of the genetic studies, but think of what we’ve learned! Framingham is really the exemplar community-based epidemiologic study, and for good reason. It has transformed our understanding of the origins of cardiovascular disease and many other chronic diseases of aging. In fact, even the term “risk factor” comes from Framingham—it was coined by Bill Kannel in one of the first big Framingham manuscripts. Framingham provided the key data that led to our current understanding of the central roles of cholesterol, smoking, blood pressure, and diabetes in development of CVD. Framingham put HDL on the map, and developed the first equations to estimate absolute cardiovascular

risk, which form the basis of our current cardiovascular disease prevention guidelines. Before Framingham, we did not understand how modifiable and preventable CVD could be.

It’s not just a cardiovascular study anymore; that’s why it’s now called the Framingham Study, not just the Framingham Heart study. For example, if you’re a participant, you can donate your brain when you die, which has created rich data on cardiovascular brain disease and dementia. They collect data on bone density, cancer incidence, sleep patterns, environmental exposures, and much more.

*“If you’re a participant, you can donate your brain when you die, which has created rich data on cardiovascular brain disease and dementia.”*

I think the Framingham experience really goes to show the power of collaboration between scientists and communities to target priority areas for improving population and individual health. Just think where we would be today if it weren’t for Framingham!

*If you are interested in reading more, there is an excellent book, A Change of Heart, by Daniel Levy (the current director of the study) and Susan Brink (New York: Knopf, 2005).*

# The Science of Public Health

*Two years into the HIV epidemic, Dr. Rebecca Wurtz attended a talk given by a CDC epidemiologist who declared definitively that an infectious disease was the cause of the mysterious and deadly immunologic illness, ending speculation that Gay-Related Immunodeficiency was caused by a recreational drug or a toxin. It would be another two years before the causative virus was identified. As the pace of spread of infectious diseases has quickened, so has the pace of scientific discovery into their causes and control. Here Dr. Wurtz writes about the hand-in-hand relationship of basic science and public health.*

Bench science and public health are two concepts that don't often appear in the same sentence. Practitioners of each have a different world view, literally and figuratively. When we picture a bench scientist, we imagine someone peering through a microscope, focused on the most minute components of health and disease. When we think of public health, we picture someone who sees the world as a series of overlapping communities, and whose tools are "macroscopic": statistics, epidemiology, and policy.

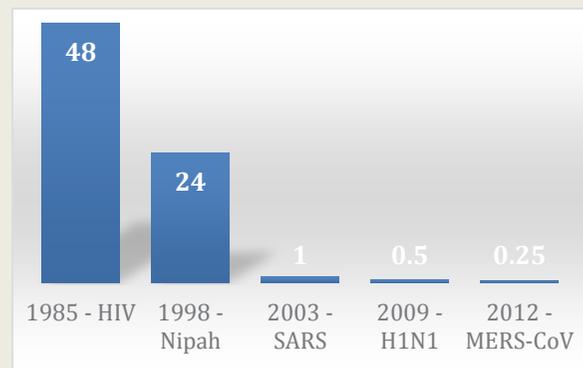


However, "wet lab" or bench-trained scientists have always had a role in public health; they provide the insights into human and cellular biology that underwrite every aspect of society's understanding of the causes and control of disease. In addition, especially in recent years, bench-derived cellular and molecular techniques have been adapted to play a role in public health investigations.

*"Public health bench researchers, in response to novel infectious disease outbreaks, create home brew molecular diagnostic tests months and sometimes years before commercial tests are available."*

Molecular epidemiology, as best demonstrated by tuberculosis outbreak analysis<sup>1</sup> and foodborne disease surveillance systems such as PulseNet,<sup>2</sup> has remade our understanding of communicable disease transmission and immunology, to say nothing of public health control efforts. "Fingerprinting" an organism—whether by pulsed field gel electrophoresis or by DNA sequencing—allows epidemiologists to gain a far more nuanced understanding of outbreaks than microbial phenotypes ever did.

The time it takes to identify novel infectious disease agents, again using molecular genetic techniques, has decreased phenomenally in the last few decades, as shown in figure 1. The SARS-like virus, MERS-CoV, currently playing a lethal game of cat and mouse in the Middle East, was identified only days after its initial isolation in Saudi Arabia,<sup>3</sup> compared to the four-plus years that it took to identify HIV.



**Figure 1. Months it has taken to identify novel infectious disease agents**

Public health bench researchers, in response to novel infectious disease outbreaks, create “home brew” molecular diagnostic tests months and sometimes years before commercial tests are available. Given the pace at which infections can spread around the world, public health scientists don't have time to wait for the validation and testing process necessary for FDA approval to release a test for widespread use.

*“The ability to control HIV or cancer will not come from an observational study but from the bench.”*

Genomics is another area that is remaking our understanding of population biology and epidemiology. It took three years and \$10,000,000, from 2001 to 2004, to go from a first draft to a final complete sequence of the human genome. Now sequencing an entire human genome can be done in less than a day for \$1,000. Tens of thousands of prokaryotic and eukaryotic genomes have been sequenced, many with an eye toward understanding the diseases encoded in their genetic material. Sequencing a portion of the genome of cholera isolates in Haiti allowed rapid determination of the South Asian origin of the strain.<sup>4</sup> Knowledge of influenza genetic variation based on sequencing allows public health officials to predict the distribution and evolution of new strains and antimicrobial resistance.<sup>5</sup>

Genome-wide association studies (GWAS) are pursuing the genetic risk factors for cardiovascular disease, cancer, and diabetes. The Framingham Heart Study, profiled elsewhere in this issue, was one of the first population-based studies to apply GWAS to its traditional epidemiologic data.<sup>6</sup> Using “paleogenetics,” sequence data for *H. pylori* have been analyzed to understand the pattern of original human migration in the Pacific

region, and to infer the social, dietary, and disease interactions in human populations.<sup>7</sup>

*“It’s this give-and-take between basic and population science that advances human knowledge and human health.”*

The ability to control HIV or cancer will not come from an observational study but from the bench. Epidemiology may help the bench researcher focus his or her efforts, and ultimately, public health will roll out the vaccinations and cures that bench scientists discover. It’s this give-and-take between basic and population science that advances human knowledge and human health.

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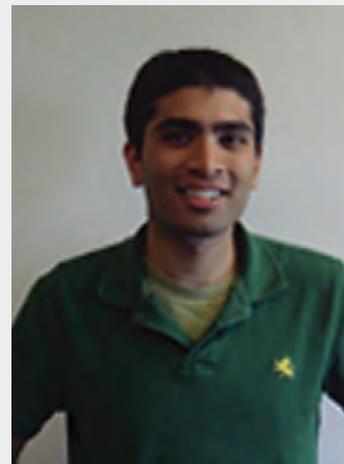
# Milestones in Public Health: Discovering Salt as a Cardiovascular Risk Factor

## An Interview with Dr. Jeremiah Stamler



*Dr. Jeremiah Stamler is a Professor Emeritus of Preventive Medicine at Northwestern's Feinberg School of Medicine, and served as the first chair of the Department of Preventive Medicine from 1971 to 1986. He is a foremost authority on the role of salt and fatty foods in hypertension and cardiovascular disease, and is considered one of the fathers of cardiovascular epidemiology and prevention.*

*Nilay Shah is an M4/MPH student at Feinberg. His public health interests are in cardiovascular epidemiology and outcomes research.*



### **Nilay Shah: What got you interested in public health to begin with?**

Dr. Jeremiah Stamler: Well, I started out mainly working in animal experimentation, with chickens, feeding [them] cholesterol and salt. We showed that if you feed cholesterol and produce hypercholesterolemia—slight, modest, or marked—you produce atherosclerosis; if you feed salt, you produce high blood pressure; if you gave the two together, you got both. That was the very beginning of the notion of risk factors. My old boss Louis Katz used to say, [a] chicken [is] a very good animal to experiment with—he's like a human: stands on two legs, eats anything you give him. So I decided we should go from our work to human work. We went to human work in two forms—population studies and clinical trials. So that's how I got interested in public health, the applicability of these kinds of animal findings to the human scene on a large scale, not only one-on-one with patients, but on populations.

So way back, sixty years ago, we had a director of the National Heart, Lung, and Blood Institute who was an epidemiologist

who built cardiovascular epidemiology and sought out young guys in departments with leading figures. Ours was such a department here in Chicago. Louis Katz was a distinguished cardiovascular physiologist [and] electrocardiographer. [He was a] master in those days of all aspects of cardiovascular disease.

Across town at that time was Dr. Oglesby Paul, who was at Presbyterian-St. Luke's. [He] began the Western Electric study [and] we began the Gas Company study [both looking at coronary heart disease]. [We worked] in parallel, comparing notes, but [keeping the studies] separate. Later on we did a whole bunch of further studies, including the National Cooperative Pooling Project, bringing together our data from several of the first generation of prospective studies—Framingham, Albany, Chicago Gas, Chicago Western Electric – eight or nine [which] we decided could be pooled. Then later on we got involved with a primary screening for recruitment for a multiple risk factor intervention trial. And that gave us a whole quantum leap, because we surveyed 361,662 people—up to then we'd been dealing with

four figures in the Gas Company and Western Electric—but now we were dealing with huge numbers. When you look at the relationship of cholesterol to risk, blood pressure to risk, anything to risk, with those kind[s] of numbers, your confidence intervals are very narrow. And as the saying goes, you better believe it!

*“So we developed intellectual responses to all those kinds of arguments, including the right to health, the right to be aware of modern knowledge.”*

**NS: As you already mentioned, you’ve been involved with a lot of large trials. What has your participation in these large-scale studies taught you about the practice of public health?**

JS: Well, public health prior to all of this coming along was more or less identical with sanitation—pure food, pure water, et cetera, and avoiding infectious disease. We helped to transform public health and bring it into the modern world, where the major mass disease problems were not infections and didn’t relate to sanitation, they related to lifestyles, and how do you influence people’s lifestyles: the way people eat, the way people exercise, get people not to smoke, if they want to use alcohol to use it in moderation. A whole new public health emerged. We developed public policy, we fought to get public policy adopted—not an easy fight because of many things, including special interests, who tried to block public policy at the national level in government, the Heart Association, every place where it was crucial to have new public policy.

**NS: Can you tell me a little bit more about the struggles that you had to push back against?**

JS: Well, what is there to say now in retrospect? We were persistent, we were perseverant, we were a broad array of scientists who had collected data that were impressive and were hard to ignore. As we kept collecting, we got more and more people convinced that what we were talking about made sense. The Heart Association led the way, the federal government was more difficult, because congressmen were always on the backs of the leadership of the National Heart, Lung, and Blood Institute, saying to them, if you go down that road, we’ll [take away] your budget.

**NS: Not easy to go up against something like that.**

JS: That’s right, it wasn’t about whether the facts were correct, it got down to questions of special interests, and whether the special interest would be served. The initial big one was tobacco, and then later on foods, [which was] much more difficult. And all the usual, of course, “You can’t tell people how to eat,” “You can’t interfere with people’s lifestyle,” “People have rights,” you know. So we developed intellectual responses to all those kinds of arguments, including the right to health, the right to be aware of modern knowledge, supermarkets that are related to modern knowledge, et cetera.

**NS: As time has gone by, people have become more cognizant of the benefits of healthy behaviors, but unfortunately, I don’t think the special interests have lost their power.**

JS: We have a way to go. We’ve made progress, you know. [T]he Western Electric data [was] the first good nutrition data we got which Dr. Paul collected; it’s a magnificent set of data. Prior to what we had done in the International Population Study of Micro/Macronutrition and Blood Pressure [INTERMAP], it was the best set of nutrition data on an American population ever collected, by a couple of very able,

hardworking nutritionists who spent more than 60 minutes with every man in that population study. The data were, you know, 43% of calories [come] from fat—43[%]!

**NS: That's amazing.**

JS: Yeah. And 17 or 18% from saturated [fat], 700 or more milligrams of cholesterol a day, polyunsaturated fat low, monounsaturated fat low, it was a disaster! Calories high, 43% of calories from fat! Concentrated calories. Nowadays if you look at the INTERMAP data that we published, the total fat is around 32%, the saturates are down from 17 to about 12%, cholesterol hovers around 100mg per 1000 kilocalories—a lot has happened! A lot more to do, and of course along the way certain aberrations that were not fully anticipated have occurred. You know, we said “reduce fats,” so many of the commercial food processors jumped on the bandwagon with special products that were low [fat] or fat-free, but loaded with concentrated carbohydrates. Certain people blamed the epidemic of obesity on us! You know, “You made these recommendations, people adopted them, and look what's happened!”

Well, that's, to put it gently, a half-truth. So, we did make the recommendations, but we didn't recommend cakes that are low-fat, high-carbohydrate. We recommended fruit, and vegetables, and whole grains, and beans, you now, the kind of food that's described when you talk about the “Mediterranean diet,” or for that matter, the “East Asian diet.” So, we have a way to go. And we are always up against unexpected, or only partially expected, special roadblocks that the people representing special interests throw our way. But, that's all right! No progress without struggle.

*“I have a simple piece of advice that applies to research, generally. And that is, don't pebble pick!”*

**NS: On that note, in your career, have there been any technological innovations or innovative ideas that have progressed the state of public health?**

JS: Well, nowadays it's so common, but the risk factor concept was a totally new approach. Most of us are trained in science in causation, dealing with simple mechanical causation—you push a board, it moves . . . [and] the cause of the motion of the board is the energy applied by the lever.

Well, cause and effect in biological systems are much more complicated than that. We had to wrestle with “How do you approach causation?” and it had to be on a probabilistic basis, that if you have more of something, you have greater risk. Many people say, well that's all very nice, all very interesting, but [that has] no application in medicine.

How do you know, if a person has a cough, fever, is spitting blood, he's got pneumonia? Well, [looking at] thousands of case reports, it's all based on accumulated experience, to get the best possible diagnosis. So if that's applicable in diagnosis, why isn't it applicable to the etiology of disease, which [is also] probabilistic in nature? So we are dealing in probabilities. If you have these exposures, your probabilities are much greater. If you have much less of those exposures, your probabilities are much less.

**NS: For those just starting to gain some experience in public health and medicine and research, what advice would you give for launching their careers?**

JS: Well, I have a simple piece of advice that applies to research, generally. And that is, don't pebble pick! A little piece of research here, a little piece of research there, and you publish a paper on each one. Instead, pick an area of work—preferably, pick an area of work that defines a tough, unsolved problem, and tackle it. It'll be hard, it'll take many years,

but if you make progress in it, because it's a major problem you'll make a major contribution. You will create a body of work . . . relating to an important problem. Tackle a big question. Have a lot of fun, and if you have a practical handle on it, if you accumulate information, it becomes impressive.

*“Truth is not neutral—truth implies certain things. The scientific community as a whole has a responsibility to advocate the application of the knowledge it generates with public dollars to benefit the public.”*

**NS: What about those who are also seeing patients? Although there's a lot of work left to be done, we know there are things people can do to reduce their risk—diet, exercise, things like that—but some people are reluctant to adopt some of these behaviors.**

JS: Yes, well, the effort to modify behavior patterns is a very complex undertaking. If you study the history of public health, at various times when major efforts have been made to modify the way people do things in order to prevent disease, you will find that invariably it's messy. But that's the nature of the beast. At a certain point it becomes critical, in my judgment, to get policy at the national level—not just locally or regionally or statewide, but the national level—with resources committed to implement that policy. It's much easier to get policy than it is [to] get resources for implementing the adoption of that policy.

So, you begin a campaign. I remember when I first started, people used to say, “You know, you're a crazy optimist—Americans like their fat! They're not going to give up their fat!” Well, it turned out not to be true! Americans are very health-conscious. Anybody who [has]

published a magazine knows, if you want to sell a magazine, you have to have two health articles in it every month. You have to have confidence that the American people are very health-conscious, that they're interested in trying to stay healthy, and reaching them involves multiple approaches and repetitive messaging—it's not a short-term thing.

**NS: You previously discussed your role in advocating for policy, and the importance of policy for modifying people's behavior. How do you balance your role as a scientist with your role as an advocate?**

JS: Well, some people say a scientist is objective, therefore he cannot be an advocate. One of my colleagues used to say, “I collect the data, and make it available to the public policy people, they do with it what they want.” But he, after time, got furious, and plunged into the battle! And I used to kid him, and say, “Welcome to the battle!” A person who is scientifically objective identifies truth. Truth is not neutral—truth implies certain things. [T]he scientific community as a whole has a responsibility to advocate the application of the knowledge it generates with public dollars to benefit the public. So, I have no trouble with that at all. I can be an advocate for truth—the only thing is I must be careful that the truth is pretty solid, and I'm not going off any deep ends; that's important. We fought all these battles in the Heart Association with the federal government because there were special interests leaning to fence us in. So I have no trouble being an advocate in favor of data that are solid and just can't be ignored.

**NS: Dr. Stamler, I really appreciate your taking the time to speak with me.**

JS: My pleasure.

*This interview is the first of a two-part interview with Dr. Stamler.*

# Work-in-Progress Report: Application to the World Health Organization Model List of Essential Medicines

*Dr. Mark Huffman MD, MPH is a cardiologist interested in global cardiovascular health, epidemiology, outcomes, and prevention research, particularly in India. Like the World Health Organization (WHO), he believes that access to essential medicines is a human right and has begun contributing to the WHO's Model List of Essential Medicines as a way to improve that access. His efforts have focused on those medicines used for cardiovascular disease prevention and control.*



## BACKGROUND

The World Health Organization (WHO) published its first Model List of Essential Medicines in 1977 to “assist Member States in formulating national drug policies”<sup>1</sup>. Access to essential medicines is part of the right to health, which was a founding principle in the WHO Constitution (1946). Specific principles regarding access to essential medicines were outlined in the Constitution’s General Comments 14 (2000), which highlighted accessibility, availability, appropriateness and quality assurance of goods and services such as essential medicines. This focus also appeared in the Millennium Development Goals (MDG 8.E: *in cooperation with pharmaceutical companies, provide access to affordable essential medicines in developing countries*). National formularies are frequently based on the WHO Model List of Essential Medicines, and when countries such as India (which uses the Model List as a guide) propose free access to medicines at public

health facilities, the Model List’s relevance increases considerably.

The most recent version of the Model List—its 18<sup>th</sup> revision—was published online in July 2013; it included more than 350 different medicines. Revisions are based upon voluntary, open applications to add, withdraw, or change the list by organizations such as Universities Allied for Essential Medicines<sup>2</sup> (UAEM), which is a group of university students that aims to leverage the positions of universities to increase access to public goods. The WHO received 52 applications for the 2013 Model List, and:

- Approved the addition of 17 new medicines
- Approved the deletion of 1 medicine
- Approved new indications for 3 medicines
- Approved the addition of a new dosage form/strength for 4 medicines
- Rejected 9 applications and deferred a decision on 2 medicines<sup>3</sup>

Debate persists about the right balance of which drugs should be considered “essential,” but most experts agree that such medicines should address an important public health problem; should be effective, safe, and cost-effective; and should be widely available. The Model List includes “core” and “complementary” medicines, the latter of which includes medicines for priority diseases or for drugs that require special monitoring.

*“When countries such as India propose free access to medicines at public health facilities, the Model List’s relevance increases considerably.”*

This debate came to my attention after I joined the Young Professionals’ Chronic Disease Network,<sup>4</sup> an advocacy organization that began as a Google group of 12 people in 2008 and now includes over 2,000 members in more than 100 countries. I originally became involved with YP-CDN because of my interest in global cardiovascular research; through the organization, I met Sandeep Kishore, who was also a board member of UAEM. As a medical student, Sandeep successfully petitioned the WHO to add simvastatin, a member of a class of drugs known as statins, which lower cholesterol and decrease the risk of heart attacks and strokes, to the Model List for the prevention and control of cardiovascular disease. This success occurred in 2009; no statin had previously been included on the list. In 2011, Sandeep participated in the application to change the model beta-blocker (a class of drugs used to lower blood pressure and protect the heart) from atenolol to bisoprolol due to the more favorable risk/benefit profile of bisoprolol. I recently joined these efforts to expand the indication of spironolactone to include heart failure in the 2013 Model List, working with team members from Northwestern (cardiology fellow Amisha Patel), Mount Sinai School of Medicine (cardiology faculty Rajesh

Vedanthan; medical students Alex Peters and Evan Blank; global health administrator Claire Hutchinson), and Cornell (medical student, Sandeep Kishore).

## **APPLICATION PROCESS**

Discussions of potential cardiovascular medicines to petition began in early 2012 and included the addition of clopidogrel, an antiplatelet medication used for heart attacks that came off patent in 2011; changing the model statin from simvastatin to atorvastatin (given the risk of myopathy associated with higher doses of simvastatin and because atorvastatin also came off patent in 2011); and expanding the indication of spironolactone from end-stage liver disease to include heart failure with left ventricular systolic dysfunction. We first approached Dr. Marcus Reidenberg, a professor of pharmacology at the Weill School of Medicine at Cornell who has served on the Expert Committee on the Selection and Use of Essential Medicines for the WHO, and who had assisted Sandeep in prior applications. Dr. Reidenberg suggested that we pursue the petition for spironolactone, as clopidogrel represented a second antiplatelet agent (aspirin being the first) and because atorvastatin was not perceived as providing a substantial improvement over simvastatin.

*“Debate persists about the right balance of which drugs should be considered essential, but most experts agree that such medicines should address an important public health problem; should be effective, safe, and cost-effective; and should be widely available.”*

We began by dividing up the application, with the medical students taking the lead on most sections (even while they were intermittently working on away rotations in sites with

spotty web access such as Mozambique). Sections included Public Health Relevance, Summary of Comparative Effectiveness, and Cost Effectiveness, among others. Drafts were uploaded onto DropBox, and monthly conference calls helped us review our progress and identify areas of additional work. Some sections such as “Summary Of Comparative Effectiveness in A Variety Of Clinical Settings” and “Summary Of Comparative Effectiveness on Safety” were relatively straightforward to write and edit, whereas other sections such as “International Availability” and “Summary of Regulatory Status” required help from organizations such as Health Alliance International, which maintains a Database on Medicine Prices, Availability, Affordability and Price Components<sup>5</sup>.

After receiving feedback and letters of support from four external reviewers, including our special consultant, Dr. Reidenberg, we submitted our petition to the WHO ahead of the December 1, 2012

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- 4) <http://www.ypchronic.org>, <http://www.ncdfree.org>
- 5) <http://www.haiweb.org/MedPriceDatabase/>

deadline. Two reviewers from the WHO Model List of Essential Medicines committee reviewed our proposal in winter 2013, the committee met in April 2013, and our application was accepted and published as part of the 18<sup>th</sup> Model List of Essential Medicines in July 2013.

## CONCLUSIONS

We understand the limitations of the Model List; in fact, a 2010 analysis of the Millennium Development Goals found that only 35% of essential medicines are available in the public sector and only 63% are available in the private sector. However, we believe that this activity nonetheless represents a tangible step to improve global access to health. As countries like Brazil, Mexico, and India provide or seek to provide universal health coverage, including access to essential medicines, we argue that our efforts can help improve such access. Our team looks forward to ongoing applications in an effort to improve subsequent editions of the Model List.

## Reflections of a Pioneering Student, Dr. Eric Skaar

*The dual PhD/MPH program at Northwestern remains one of the only programs in the country that allows students to obtain a PhD in any program and a master's in public health concurrently. This program would not exist without the pioneering efforts of the first dual degree student, Dr. Eric Skaar. Curious as to his inspiration and challenges in advocating for the joint PhD/MPH, the editors at the NPHR reached out to Dr. Skaar, now an associate professor at Vanderbilt, to share his story.*



My interest in infectious disease research started when I was in high school. I was lucky to attend a public high school in suburban Chicago that offered a class in microbiology. I can even remember the moment I learned about the mechanism of action of penicillin; and from that moment forward I knew that I would work towards a career studying bacterial pathogens. Following high school I attended the University of Wisconsin at Madison and majored in Bacteriology. During that time I performed research in Dr. Timothy Donohue's laboratory studying single carbon metabolism in *Rhodobacter sphaeroides*. This experience solidified my interest in microbiology and provided insight into the career options that exist in academia for someone interested in biomedical research. With this information in hand, I enrolled in the Integrated Graduate Program (IGP) in September 1997 at Northwestern University Medical School and started my thesis work in the laboratory of Dr. Hank Seifert, where my PhD thesis studies focused on antigenic variation in *Neisseria gonorrhoeae*, the causative agent of the disease gonorrhea.

*"I can even remember the moment I learned about the mechanism of action of penicillin; and from that moment forward I knew that I would work towards a career studying bacterial pathogens."*

I have always been very interested in the pathologic manifestations of infections caused by microbial pathogens. This interest became more pronounced while working in the Seifert laboratory, where the research was focused on an organism that places a tremendous burden on global public health. During my second year of graduate school I began to go through that period that I believe most graduate students go through where you realize that the clock is ticking and you don't have much data yet, and you begin to wonder if bench science is the right career for you. Simultaneously, I was becoming more and more interested in the growing field of molecular epidemiology. The revolution in molecular biology had finally begun to affect the practice of epidemiology and I was excited about the potential that this interdisciplinary approach to public health could have on our understanding of how organisms such as *N. gonorrhoeae* are transmitted. However, I was concerned that training exclusively in molecular biology would not give me the expertise that I needed to truly understand the dynamic process of microbial transmission and spread. When I learned that Northwestern Medical School had a part-time Master's in Public Health Program in place for medical students, this seemed like an excellent opportunity for me to expand my thesis training into public health, with the long-term goal of a career in molecular epidemiology. In particular, I had become very interested in pursuing a position as an Epidemic Intelligence Service (EIS) officer for

the CDC and I thought that this dual degree would ideally position me for the EIS program. The only problem was that PhD students were not allowed into the MPH program at that time.

When I first inquired with the graduate school about the possibility of enrolling in the MPH program, I was told that there was no way I would be allowed to enroll in this Master's program as a PhD student as this program was designed exclusively for the MD students. I thought this to be very silly as I was convinced that training in the MPH program would enhance my education and improve my career outlook so I launched a search to find an advocate who could help me make this plan a reality. Over a period of a few weeks I worked my way through various members of the Department of Microbiology and Immunology, the Department of Preventative Medicine, and the Integrated Graduate Program in Life Sciences until I finally had a meeting with Dr. James Duncan, who at the time was a faculty member in the Department of Microbiology and Immunology and a Dean of the Graduate School. Dean Duncan and I had a long discussion about my interests and reasoning behind wanting to enroll in the MPH program, and he expressed concerns regarding the workload involved in obtaining a PhD being incompatible with an additional part-time graduate program. However, in the end he saw the value that a PhD/MPH could bring to someone with an interest in molecular epidemiology, and he told me that I would be allowed to enroll in the program as long as Dr. Seifert approved, which he did. Dr. Seifert was a tremendous mentor to me during this time; now that I run my own laboratory, I realize how much it was asking of him to allow me to take on this additional responsibility when the vast majority of my time should have been spent at the bench. If it wasn't for his support, I certainly would have never moved forward with my efforts to obtain an MPH.

Once I had the blessings of Drs. Seifert and Duncan, all of the red tape disappeared and I was rapidly engaged in meetings with members of the IGP and Department of Preventative Medicine to create a curriculum suitable for a PhD student with my interests. During the initial design of the dual degree curriculum, Dr. Steven Anderson was exceptionally helpful on the IGP side and Drs. Rowland ("Bing") Chang, Maureen Moran, and Susan Gapstur were very helpful on the Public Health side. In fact, Dr. Gapstur generously agreed to be my thesis advisor for the MPH portion of my training and I am tremendously thankful to her for all of the support and assistance she gave me during my time in graduate school. There were many meetings in those early days where we discussed the number and make-up of the courses I would take. It was agreed that the core curriculum would not be changed much, but in some cases the elective courses that were in place were not relevant for my training. In those cases, the institution was very flexible and allowed me to enroll in courses through the genetic counseling program to satisfy some of my elective requirements. It was also decided that my MPH thesis should complement my PhD thesis, so my MPH thesis focused on sequencing clinical samples of *N. gonorrhoeae* in an effort to identify variations in gonococcal surface proteins in isolates from multiple patients.

*“I was told that there was no way I would be allowed to enroll in this Master's program as a PhD student as this program was designed exclusively for the MD students. I thought this to be very silly as I was convinced that training in the MPH program would enhance my education and improve my career outlook.”*

My time as a dual PhD/MPH student was challenging. I have vivid memories of having to stop experiments at 5:30 in the Seifert lab so I could spend 30 minutes doing my biostatistics homework before my 6:00–9:00 PM biostatistics class. I also remember many, many nights in the drive-through line at the Portillo's on Ontario because Portillo's was the only restaurant in the area besides McDonald's that had a drive-through and was open after 9:00 PM. In addition to all the hard work, I remember developing a deep appreciation for the practice of epidemiology, which improved the quality and rigor of my PhD thesis. As I progressed through my thesis, I was fortunate to begin to experience success at the bench. This success strengthened my confidence that perhaps I had what it took to pursue a career in academia, so I decided to forgo applications to the EIS Program and instead pursued more traditional postdoctoral training in the laboratory of Dr. Olaf Schneewind at the University of Chicago. My MPH had taught me about the significant burden that infectious diseases place on public health; Dr. Schneewind's laboratory researches *Staphylococcus aureus*, which is the most common cause of infectious disease in the United States. During my time in the Schneewind laboratory, I employed many of the skills I learned in the MPH program, most notably the ability to apply rigorous quantitative analysis to complex molecular data. I remember all the wonderful people who I met in both programs and I am indebted to those individuals who provided me with the opportunity to obtain a truly interdisciplinary training experience.

After I started my program, a few additional students also decided to pursue the dual degree option on an ad hoc basis. Hank Seifert (Director of the IGP) and Steve Anderson (Associate Director of the IGP) decided to make this program formal, and, after consultation with the Public Health program, they put in a request for a new dual degree program to the Northwestern Graduate

School, which was approved in 2002. The first formal class matriculated in 2003.

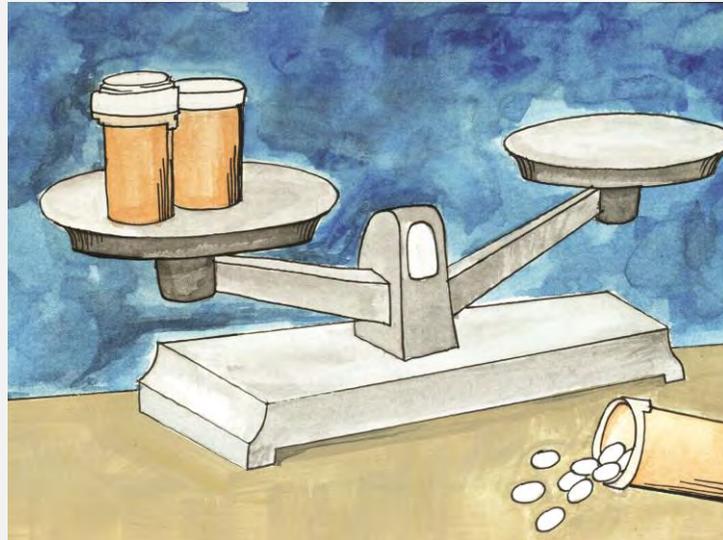
Currently, I am an Associate Professor in Pathology, Microbiology, and Immunology at Vanderbilt University School of Medicine and the Chief of the Division of Host-Pathogen Interactions. My laboratory is focused on understanding how bacterial pathogens acquire nutrients during infection that enable them to replicate and cause disease in human hosts. We focus on infections caused by *Staphylococcus aureus* (Staph infections), *Acinetobacter baumannii* (hospital-acquired infections), and *Bacillus anthracis* (anthrax). My laboratory takes a diverse approach to this research topic, employing techniques ranging from chemistry and biochemistry to imaging and epidemiology. Molecular epidemiology is not the primary focus of my lab, but we do have a number of epidemiology projects that are currently ongoing. In addition, I am certain that my simultaneous training in molecular biology and epidemiology has provided me with a large and diverse toolbox that has improved my lab's ability to ask penetrating questions and apply diverse techniques to answer those questions.

It is my understanding that 27 students are enrolled in or have completed the dual PhD/MPH program at Northwestern. I am thrilled to know that the institution has created a formal path for these students, and that there are this many students interested in merging these two exciting fields of study. I think that the leadership at Northwestern and the faculty listed above should be credited for their flexibility and creative approach to graduate education, as I am confident that there are not many other schools in the nation who would have seen the potential and created such a program.

# The Urgent Need to Amend the Illinois State SMART Act

## A Final Refuge for the Mentally Ill

*Osefame Ewaleifoh is a second-year PhD/MPH student in the Driskill Graduate Program at Northwestern University. He currently works in the laboratory of Dr. Greg Smith, where he studies herpes simplex virus neuroinvasion and transport. Osefame is a passionate mental health advocate who seeks to draw attention to disparities in mental health access and resource utilization.*



Artwork by Michelle Chabla

### **An Assault on Access to Mental Health Care**

The recent passage of the Patient Protection and Affordable Care Act (PPACA) and other legislative efforts has raised the question: how does the PPACA affect mental health access? Access to mental health care is particularly significant because mental health serves as a powerful comorbidity for several pathological conditions, including diabetes and obesity. Furthermore, the cumulative cost of managing mental illness—a chronic life condition—very quickly becomes prohibitive for most patients. The financial cost of treating mental health is even more debilitating in poor communities. Historically, Medicaid has provided a safe refuge for the poor, who otherwise could not afford the mental health care they desperately need. However, recent national economic and financial constraints pose severe threats to Medicaid as a source of mental health care.

Specifically, the recently passed Save Medicaid Access and Resources Together (SMART) Act in Illinois threatens to take much-needed medical resources away from mentally ill citizens of limited means—the people who often need these services the most. This article explores the cost of mental illness and care, the health implications of the recently passed SMART Act, and potential strategies to protect our most vulnerable residents from those consequences.

### **The SMART Act and Mental Health**

In the last few years, several states have adopted aggressive strategies to reduce the ballooning cost of health care. In Illinois, the exploding deficit and increasing cost of health care led to the enactment of the SMART Act in 2012. While the broad objective of the SMART Act was to trim down the cost of health care in the state, a central core of the Act was requiring Medicaid recipients to get prior authorization from their doctor for any

prescription medications numbering over four-per-month. Specifically, the SMART Act states: “On and after July 1, 2012, the Department shall impose limitations on prescription drugs such that the Department shall not provide reimbursement for more than 4 prescriptions, including 3 brand name prescriptions, for distinct drugs in a 30-day period, unless prior approval is received for all prescriptions in excess of the 4-prescription limit.”<sup>1</sup> While the stated objective of the SMART Act is to curtail the skyrocketing cost of health care, it is impossible to ignore its potentially devastating effect on access to care for the mentally ill.

Several recent studies indicate that the cost of care is the fundamental limiting factor to the utilization of and access to mental health services. In a recent report from the Substance Abuse and Mental Health Services Administration (SAMHSA), the single biggest reason for not receiving mental health services is “Could Not Afford the Cost.” When cost is combined with responses around under-insurance, over 65 percent cited money-related issues as the primary reason for not pursuing treatment.<sup>2</sup>

*“While the stated objective of the SMART Act is to curtail the skyrocketing cost of health care, it is impossible to ignore its potentially devastating effect on access to care for the mentally ill.”*

This economic bottleneck is particularly important because mentally ill patients are already less likely to stick with treatment regimens. Structural limitations to access to care will thus only exacerbate already poor access to care and treatment adherence among the mentally ill. It is imperative that strategies be put in place to address these obstacles to care.

## Policy Options

The following three specific policy options could be used to combat the current draconian measures that could potentially restrict health care access for the mentally ill:

1) The 4-drug limit of the SMART Act can be completely rescinded. There is no medical or financial evidence to suggest that it will lead to any significant cost savings. On the contrary there is good reason to believe that this Act will lead to medication and care rationing, which will in turn lead to inadequate treatment of sick patients. This will ultimately culminate in a health care system with much sicker patients, leading to a greater drain on already limited financial resources.

2) Alternatively, the SMART Act could be amended to exempt from the 4-drug limit persons who are on Medicaid due to disability or mental illness. A slight variation on this could be an amendment of the SMART Act to exempt psychotropic medications, or at least exempt anti-psychotic and anti-depressant medications. As currently written, the SMART Act does make some exceptions for certain drug classifications: “Drugs in the following therapeutic classes shall not be subject to prior approval as a result of the 4-prescription limit: immunosuppressant drugs, oncolytic drugs, and anti-retroviral drugs.”<sup>3</sup> Based on these existing exemptions, similar exceptions could be made for psychotropic drugs. Exceptions to psychotropic drugs are critical because these treatments provide a fundamental cornerstone to contemporary mental health care.<sup>4</sup>

3) In the event of failure of these two earlier policy recommendations, an improvement of the prior authorization process must be pursued. The central objective of such an effort is to make the process less daunting for vulnerable, mentally ill patients who might be discouraged by administrative hoops and bureaucratic bottlenecks. Specifically, two primary steps can be taken to improve the

prior authorization process: first, the application should be an electronic mail or web-based submission process. This would significantly simplify the application process for potential users. Second, the approval process must be transparent. The transparency of the approval process can be promoted by publishing standards and procedures for prior authorization. This system will ensure that the reasons behind approval or rejection of submitted requests for drug requirements beyond the 4-drug cap will be clear and unambiguous.

*“There is good reason to believe that this Act will lead to medication and care rationing, which will in turn lead to inadequate treatment of sick patients.”*

### **Health Implications**

The 2001–2003 National Comorbidity Survey Replication (NCS-R), a nationally representative epidemiological survey, revealed that more than 68 percent of adults with a mental disorder (diagnosed with a structured clinical interview) reported having at least one general medical disorder.<sup>5,6</sup> As a thoroughly characterized comorbidity, mental illness has been implicated in exacerbating several disease outcomes including diabetes,<sup>7,8</sup> asthma,<sup>9</sup> obesity,<sup>10</sup> and cardiovascular conditions.<sup>11</sup> Mental illness has also been implicated with increased health risk behaviors such as chronic tobacco use and substance abuse.<sup>12</sup> Thus, as currently written, the 4-drug rule of the SMART Act could impact more than just mentally ill patients; it could have far-reaching ripple

effects on patient health across the health care spectrum.

The role of mental health as a prevalent comorbidity of several disease pathologies makes it medically and morally imperative that measures be put in place to prevent restriction of access to mental health care.

### **Current Legislative Action**

To stem potentially detrimental health, social, and economic effects, Illinois State Representative Chapa LaVia has recently introduced House Bill 2469, which would carve out several psychotropic medications from the SMART Act’s 4-drug limit. While daunting, the challenge of passing the bill is not unfeasible, as a similar exemption has already been made for immunosuppressant drugs, oncolytic drugs, and anti-retroviral drugs. With the appropriate political, legal, and strategic arguments, the desired modifications to the existing Act can be obtained.



*Artwork by Meghan McCarter*

### **Conclusion**

In the current push to find new ways to manage health costs, the knee-jerk reaction to slash access to health care services is a predictable response. This strategy is reflected by the 4-drug rule of SMART Act. Yet while limiting drug access might seem appealing initially, a closer analysis reveals that it could lead to disastrous consequences. Three nuanced strategies are proposed here to both manage costs and ensure access to much-needed psychotropic drugs. If adopted, these strategies will ensure the SMART Act fulfills its stated objective of cutting health care costs while at the same time ensuring that the mentally ill recipients of Medicaid continue to get access to the psychotropic medications they desperately need.

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# The Early Days of HIV/AIDS at Northwestern

*Dr. John Phair joined the faculty of Northwestern Medical School in 1976 as director of the Division of Infectious Diseases. He led the Multicenter AIDS Cohort Study (MACs), an NIH-funded observational epidemiologic investigation of HIV infection and disease in men who have sex with men, from 1984 until 2012. From 1992 to 1994, Dr. Phair served as Chair of the Executive Committee of the AIDS Clinical Trials Group (ACTG), a network of academic centers evaluating antiretroviral therapy. In 2000 he stepped down as director of the Division of Infectious Diseases and assumed Emeritus status, but he continues to participate as an investigator in the MACs.*

In the spring of 1981 I was asked to see a patient with Kaposi's sarcoma (KS) by the oncologists at Northwestern. The gentleman had been diagnosed at the Mayo Clinic, where a second diagnosis of Whipple's disease had also been established by a bowel biopsy. He had a low-grade fever; the oncologists wished to start chemotherapy and asked if there was any infectious disease problem which prevented treatment of the KS. The patient was receiving tetracycline for the "Whipple's disease" and there was no other obvious source of fever. He received one dose of cytoxan and developed a bilateral interstitial pneumonia. Bronchoscopy established the diagnosis of pneumocystosis and appropriate treatment was initiated, yet the patient died within several days. This series of events had no explanation and I was perplexed.

In June of 1981 the CDC reported five similar cases in Los Angeles—all previously healthy young men who had sex with men, and each with a profound disturbance of his immune system. I asked the primary physician of our patient if he knew the gentleman's sexual preference and he stated that he was gay. In retrospect, this man had been the first patient with AIDS seen at Northwestern Memorial Hospital (NMH). He had KS and pneumocystosis. Probably the rods noted in the colonic biopsy were Mycobacterial of the Avian Complex, not *Tropheryma whipplei*.

By the middle of the decade, ten percent of the medical beds at NMH were filled by men with AIDS. Dr. Robert Murphy, who joined the Infectious Diseases faculty to help with care of these patients in the mid-1980s,

signed the most death certificates of any member of the medical staff. The impact of this epidemic changed to a large extent the focus of many of the NU Infectious Diseases faculty. Prior to AIDS we functioned as consultants, but now we were primary care physicians for patients with AIDS. We had nothing to offer these patients except management of complications of the immune deficiency—and compassion.

The epidemic arrived in Chicago later than on either coast. In 1986, we retrospectively assayed for evidence of HIV infection in sera collected between 1982-83 from approximately 80 men who had sex with men. From this cohort, only ten percent had antibody to HIV. One year later, in 1984, after we recruited 1100 men who had sex with men for the Multicenter AIDS Cohort Study, we found that forty percent of them were infected with the virus. Initially in Chicago the infection appeared to be localized to the white gay community and focused in the near north side. Soon, however, it became apparent that persons city-wide who injected drugs were infected, as were their sexual partners. With the spread of infection to women, it became apparent that infected pregnant women could infect their children either during childbirth or in utero. It also was recognized that blood products were infectious.

The Chicago Department of Health established an Advisory Committee to help plan a response to this epidemic. With the availability of Ryan White funds from the Federal Government and the opening of the

CORE Center by Cook County Hospital and Rush University, a county-wide system of care was developed.

The majority of medical centers in Chicago established clinics to care for HIV-infected persons and devised appropriate policies to prevent accidental infections of personnel and patients. At NMH, the administration was extremely supportive and developed a plan to care for HIV-infected persons in the hospital and in the newly established Infectious Disease clinic.

*“By the middle of the decade, ten percent of the medical beds at NMH were filled by men with AIDS.”*

A number of Chicago infectious disease specialists participated in programs to help defuse concern (and often panic) among Chicagoans. Programs to educate police, firemen, EMTs, and school officials were undertaken. Individual physicians spoke at schools when concerns regarding the presence of infected children in class arose.

In 1987, azidothymidine (AZT) was rapidly approved by the FDA and there was hope that treatment would now be available for the viral infection. However, this agent was of limited efficacy and extremely toxic in doses used at first. Even with dosage reduction, nausea, anemia and myopathy presented problems for treated patients. In that year Northwestern, Rush, and later Cook County Hospital received funding from the National Institute of Allergy and Infectious Diseases to establish the Chicago AIDS Clinical Trials Unit. This was a component of the AIDS Clinical Trials Group (ACTG), a network of medical institutions in the US which

evaluated therapies for HIV infection and its complications.

The contributions of the ACTG included improvement in the management of pneumocystosis, development of strategies to prevent infectious complications of HIV infection, improved treatment for KS and HIV-related non-Hodgkins lymphoma, prevention of maternal transmission of HIV to the child, and most recently refinement of the use of combined antiretroviral agents to suppress viral replication and partially restore immune function.

Although no cure is available, the story of AIDS has been one of success in developing methods of managing HIV infection and its complications. However, with prolongation of survival, diseases of aging including cardiovascular disease, diabetes, liver disease and kidney disease are appearing at an increasing rate in HIV-infected individuals. Moreover, it is estimated that close to a quarter of those infected in the US are unaware of their infection and serve as a source of new infections. In Chicago, as in the nation, there is a need to address this problem using innovative approaches that are sensitive to the different cultural characteristics of the persons at risk.

*“Although no cure is available, the story of AIDS has been one of success in developing methods of managing HIV infection and its complications.”*

# Behind the Public Face of Healthcare – A Look Inside the Illinois Department of Public Health

*Celeste Mallama is a third-year PhD/MPH candidate in the Driskill Graduate Program at Northwestern University. She works in the laboratory of Dr. Nicholas Cianciotto, examining the interaction between Legionella pneumophila and the host innate immune system. She recently spent a summer at the Illinois Department of Public Health, completing her field experience for her MPH.*

In the face of growing efforts to reduce states' financial commitments and streamline responsibilities, various government agencies are increasingly under pressure to justify their existence. In this article, I assess the success of a state agency, the Illinois Department of Public Health, in maintaining and promoting public health across the state—and in making that work known.

## Public Health in the Public Eye

Doctors and nurses tend to be the face of public health in America, and why not? When we get sick or need a vaccination, we head to our nearest health clinic and are seen by a healthcare professional who treats us and sends us on our way.

We are often less aware of the vast network and infrastructure of public health agencies that exist outside of this clinical setting. This lack of visibility makes it difficult for these agencies to procure funding for their work. The function of public health work is to keep the population healthy before problems arise, but since the press tends not to cover the *absence* of an outbreak, public health agencies for the most part stay out of the limelight.

The Illinois Department of Public Health (IDPH) serves as a centralized agency for public health-based screening and testing in Illinois. It houses laboratories in Springfield, Carbondale, and Chicago that provide essential health-related services that are not often visible to the general population. A few of these services are reviewed here.

## Newborn Screening

Every day in Illinois between 500 and 700 infants are born. From 24 to 48 hours after birth, each of these infants undergoes a “heel stick.” This procedure consists of a nurse pricking the infant’s heel with a needle and collecting seven blood spots on filter paper. These filter paper spots are dried and packed into an envelope at the end of the day and sent off to the IDPH for processing. This is where health work leaves the public eye. The next time the patient has contact with these samples is when the doctor calls and tells the parents that everything is fine and their baby is healthy, or that follow-up tests are needed. What happens in the interim?

Every day around 11:00am, the filter paper samples reach the newborn screening laboratory, which is by far the largest section at the Chicago branch of the IDPH. These samples are sorted in the mail room and passed onto employees who run the screening tests.

*“We are often less aware of the vast network and infrastructure of public health agencies that exist outside of this clinical setting.”*

Each screening test performed at IDPH uses as its sample the filter paper blood spots from the heel stick. On a Monday, when the samples have built up over the weekend, there could be as many as 2,100 blood samples run per diagnostic test. In Illinois, all infants are screened for biotinidase deficiency,

galactosemia, congenital adrenal hyperplasia, hypothyroidism, phenylketonuria, sickle cell disease, amino acid/urea cycle disorders, fatty acid oxidation disorders, organic acid disorders, and cystic fibrosis. Results from these tests are returned to the clinician, where they reappear in the public eye in the form of a note on a patient's record or a phone call from a doctor.

**Table 1: Newborn Screening Tests**

Disease	Basis of Disease	Prevalence
Galactosemia	Absence of GALT, an enzyme that breaks down galactose	1:60,000
Biotinidase Deficiency	Absence of functional biotinidase, inability to extract biotin from food source	1:150,000
Hypothyroidism	Absence of functional thyroid hormone	1:3,500
Sickle Cell Disease	Hemoglobin disorder	Variable
Congenital Adrenal Hyperplasia	Absence of the hormone cortisol	1:15,000
Amino Acid Disorders, Urea Cycle Disorders, Organic Acid disorders, Fatty Acid Oxidation Disorders	Elevated analyte levels	Variable
Phenylketonuria (PKU)	Elevated phenylketone levels	1:12,000
Cystic Fibrosis	Pulmonary and pancreatic insufficiency	1:4,000

## Water Testing

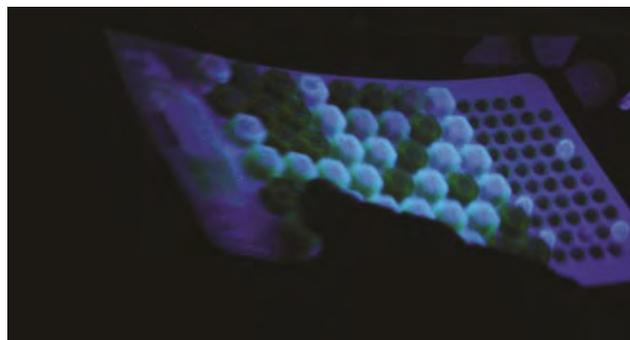
The IDPH also has a significant behind-the-scenes role in the health of swimmers and beachgoers in the state of Illinois. On hot summer days, thousands of Illinois residents head down to the beach for a swim only to find that it's been closed due to high *E. coli* counts. Those closures are based on tests performed by the IDPH. Bacteria and contaminants in the water are dredged up by swimmers or by runoff during a strong rain, and then they multiply in the lake water. Once every two weeks, the IDPH receives water samples from public beaches collected by local county health department sanitarians and tests them for *E. coli* contamination.

A colilert™ packet, which contains a substrate that turns yellow when metabolized by coliforms and fluoresces when metabolized by

*E. coli*, is added to each water sample. The next day, the sample is analyzed by eye and under fluorescent lights to measure coliform and *E. coli* contamination. If the *E. coli* count is over 235 CFU/100mL, the beach is closed until the count is low enough to safely permit swimming.



*Figure 1: Water samples under normal light, where the water has turned yellow from the colilert™ substrate that has been metabolized by coliforms present in the lake water.*



*Figure 2: Water sample under UV light, where the water is fluorescing from the colilert™ substrate that has been metabolized by E. coli present in the lake water.*

## Dairy Testing

We often read about foodborne illness outbreaks, but less well known are the measures taken to prevent them. The environmental microbiology section of the IDPH receives samples from the local county health sanitarians who bring in cream, milk, ice cream, and raw mixes from dairy companies across Illinois. These dairy samples are diluted and spotted on petrifilm™ paper, which allows the coliform units to be counted. When these counts are over a certain

threshold, the dairy company is notified not to release those products to the public.

Bacterial contamination is not the only concern with dairy products; antibiotic levels also need to be tested. When a cow has mastitis, an infection of the udder, it's given antibiotics, and these  $\beta$ -lactams are then present in the milk it produces. This is a problem on two levels: it contributes to the overutilization of antibiotics, and it could also pose a serious hazard for those who are allergic. To test for  $\beta$ -lactam levels, a sample of the dairy product is placed on media that has been inoculated with bacteria and a growth enhancer. If antibiotics are present in the dairy product, a lack of bacterial growth will be seen.



Figure 3: Dairy mixes collected by county sanitarians from dairy companies and delivered to the IDPH for testing.

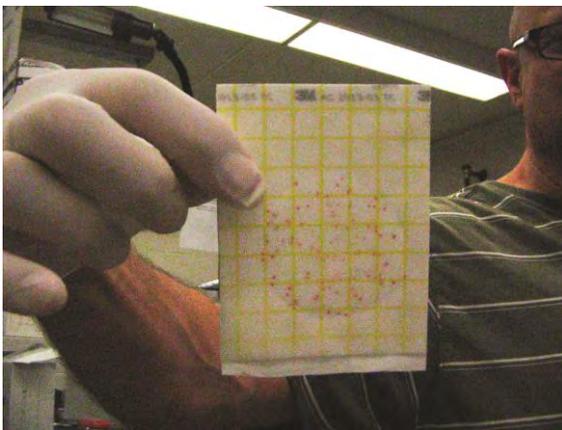


Figure 4: Coliforms (red dots) present in the dairy sample that have grown on the petrifilm™.

## Sexually Transmitted Infections (STIs)

The IDPH also provides STI testing. Every day in the afternoon, swab, urine, and blood samples from patients seen at public clinics come in by mail or by messenger to be tested for chlamydia, gonorrhea, HIV, and syphilis. Between 200 and 400 samples are collected in the mail room of the IDPH and are processed for testing daily. Polymerase chain reaction (PCR), in which bacteria are lysed and DNA is amplified, is run on urine and swab samples, testing for the presence of gonorrhea and chlamydia. Venous blood samples are tested for the presence of antibody against HIV antigen and *Treponema pallidum*, the bacterium that causes syphilis. This testing is incredibly thorough; two separate assays are used to test for the presence of HIV antibody in venous blood samples, and PCR is used as a final gold standard if the results are inconclusive or contradictory. Three separate assays are also utilized for syphilis testing, all of which rely on antigen-antibody binding.

The results are faxed back to public health clinics, which then alert the patient whether or not he or she needs to come back for treatment. In the case of a positive test, a health officer will often also notify all the reported sexual partners of the patient to alert them of the need to get tested and treated as well.

This role of the IDPH in monitoring STIs in the state is especially important considering the fact that as of 2011 Cook County had the highest rate of gonorrhea<sup>1</sup> and second highest rate of chlamydia<sup>2</sup> of anywhere in the US.

## Virology

Every winter a new flu vaccine is issued to the public, and the IDPH plays a part in its production. During the flu season, clinicians send nasopharyngeal swabs to the IDPH from patients who are exhibiting influenza symptoms. Using PCR, the IDPH classifies the category of influenza virus that is the etiologic agent of the flu, and then sends these samples onto the CDC. Scientists at the CDC use these

influenza samples from all over the United States to predict what the prevalent influenza virus subtype will be for next winter, and from there they create the subsequent year's vaccine.

## **Rabies**

From time to time, residents of Illinois come into contact with animals suspected of having rabies. When this happens, Animal Care and Control (ACC) euthanizes the animal and, if it's a large species, severs the head. Once the animal has been taken care of, the resident needs to know if they should go to their healthcare provider for a rabies vaccination.

The IDPH performs this testing. Every afternoon, severed heads from animals suspected of having rabies are delivered to the IDPH. There, they are dissected, and the cerebellum and medulla are extracted. The brain tissue is probed with fluorescent labels that bind to any viral particles that would be present in an infected animal. In the case of a positive assessment, ACC and the Springfield lab are notified. These organizations then contact affected residents to let them know that they should be vaccinated immediately.

*“The staff at the IDPH are keenly aware of their work’s significant implications to the quality of life of everyday citizens.”*

## **Lead Testing**

Most residents of Illinois receive an informational packet about lead poisoning when they move into a new apartment or home. Some of the older buildings in Chicago and the suburbs still have lead-based paint; if this paint sheds from the walls and is unknowingly ingested or inhaled, it could lead to lead poisoning.

When patients go to their doctors for suspected lead poisoning, a blood sample is

drawn and the venous blood is tested for lead levels, but what about the environmental exposure?

Any soil, paint or miscellaneous object that is suspected of being a source of lead poisoning is sent to the IDPH. There, the sample is ground, dissolved in acid, and run through an inductively coupled plasma optical emission spectrometer. This instrument provides a reading of the lead levels present in the sample. If the sample returns a reading over the acceptable threshold, the IDPH and the local county health department work in tandem to remediate the area.

## **This is not a test tube. This is a person.**

After two months at the IDPH one thing is clear—public health workers in agencies like the IDPH provide invaluable services and they count on our support to keep their doors open. While the IDPH is hidden from public view and few are aware of its existence, the staff at the IDPH are keenly aware of their work’s significant implications to the quality of life of everyday citizens. As the departments of the IDPH test the never-ending stream of dairy, water, blood, urine, sputum, and swab samples that arrive every day, the source of that sample and the impact of the result is always on their minds. The most impressive aspect of this organization is the care it takes of its “patients” even when these patients are completely unaware of its existence. The employees of the IDPH take pride in their work, and if asked why, they will hold up a sample and state, “This is not a test tube. This is a person.”

## **References**

1. <http://www.cdc.gov/std/stats11/tables/20.htm>
2. <http://www.cdc.gov/std/stats11/tables/9.htm>

## Combating Vertical HIV Transmission and Maternal and Child Mortality in Ethiopia

*Kate Klein is an MPH student in the Program in Public Health at Northwestern's Feinberg School of Medicine. She also serves as the Assistant Director at the Program of African Studies at Northwestern. She recently worked with IntraHealth International as part of her internship with USAID's Africa Bureau in five regions of Ethiopia.*

In Ethiopia, the prevalence of HIV, at 1.4 percent, is not high compared to other countries in sub-Saharan Africa. Some attribute this to the tight borders Ethiopia keeps from neighbors Eritrea, Sudan, Somalia, and particularly Kenya, whose prevalence is much higher, at 6.3 percent. The widespread practice of the conservative Ethiopian Orthodox religion, which advocates strong commitment to marriage and faithfulness, may also help explain the low figure. Finally, there is the recent fiscal dedication of the Ethiopia government toward improving healthcare infrastructure. It may be for these reasons and more that Ethiopia is one of only seven countries that have halved their HIV prevalence since 2009.<sup>1</sup>

*“Only 10 percent of all pregnant women in Ethiopia give birth in a health center.”*

Despite these facts, there is still one fast avenue for transmission—from mother to child, or vertical transmission. Much of the reason for this high rate of vertical transmission can be traced to another public health problem: only 10 percent of all pregnant women in Ethiopia give birth in a health center. Those who do reside mainly in the cities, of which there are few in Ethiopia. With 90 percent of women giving birth at home, we also see high rates of maternal mortality (676/100,000) and under-five child mortality (88/1,000).<sup>2</sup> Despite years of

fighting this problem, the rates have not gotten better.

In recent years the Ethiopian government has begun efforts to address this and other public health problems. They are one of the few countries to meet the Millennium Development Goal of devoting 16 percent of their budget to health care.<sup>3</sup> The Ministry of Health began, about three years ago, to rapidly increase the number of health centers and health posts across the country. The health centers serve as places for uncomplicated medical care and health posts serve as sites for outreach and education activities. One of the main problems, as the government saw it, was that women did not have access to health centers and that was why they gave birth at home. They then made antenatal care (ANC), delivery, and post-natal services free to all women: the “if you build it, they will come” theory. Unfortunately, every health center is meant to serve a catchment population of 25,000 people, and many people live as much as five hours away from these centers by foot. The roads are often drivable only by 4x4 cars, yet people rarely own cars there, and there is generally only one ambulance—which is often out of fuel and can take hours to arrive.

One of the only other options for women is to take a “human ambulance,” which consists of about six men carrying a stretcher to the hospital. Unfortunately, this can also take hours and women fear looking weak to their



community. Indeed, fear of appearing weak to others is just one of the many cultural barriers to giving birth at the health center; these factors are just as important as infrastructural barriers. In different regions of Ethiopia there are

different cultural barriers, but I will list just a few of the most common.<sup>4</sup> As mentioned, to be thought of as a strong woman is an important trait. For pregnant women, showing weakness by making pained sounds during labor or delivery is shameful. It seemed very odd to me to enter delivery rooms in which all of the women were completely silent. Indeed, even going to the health center before labor is in the final stages is considered weak. The problem becomes that if you wait until labor is strong, it is too late to make it to the health center for fear of delivering on the way.

Another barrier comes from the family, particularly the mother-in-law. There is a long tradition of using traditional birth attendants or family members to attend to birth. There can be strong pressure from the family to deliver at home. They feel this way because they themselves delivered at home and see no problem with it. There is also the belief that by giving birth at home the baby truly belongs to the family. If they give birth somewhere else the baby has no home. Indeed, it is customary in some parts of Ethiopia to bury the placenta behind the house but at the health center they are not allowed to take the placenta with them. Finally, in this deeply religious country, there is the belief that Saint Mary is not in the health center, but only in the home watching over the birth. Therefore by giving birth in the health center mothers fear that the birth will not be blessed.

Of course, there are other barriers that fall somewhere between infrastructure and culture. Women complain that the health centers are poorly heated. Built out of concrete with no heaters, the health centers located in the highlands can get very cold. Another complaint is that there is no privacy or waiting room during labor. Indeed, most delivery rooms have only two delivery couches, which are in an open room with no space to wait while they are in labor. In fact, in Ethiopia many women prefer to deliver in a squatting position, which is impossible at the health center. Furthermore, it is common for the family of the woman to prepare a coffee ceremony and some porridge both before and after the birth. In the health center there is no food or water and many times the family is not allowed to be with the woman giving birth. Lastly, women are only allowed to stay about six hours after birth, or ten hours if there is complication. At this point transportation issues come into play.

*“One of the only other options for women is to take a human ambulance, which consists of about six men carrying a stretcher to the hospital.”*

Adding HIV infection into the equation complicates all of the above. On average, 71 percent of women do not use any form of contraception<sup>5</sup>, so pregnancy in HIV-positive women is common. The Ministry of Health, USAID, and numerous international and local NGOs are working to reach these women early, as prompt treatment with ART prophylaxis, skilled delivery, and treatment of the infant within the first 45 days of life can make an incredible difference in stopping vertical transmission. In recent years, the Ministry of Health has opened five health posts for every health center. Each health post employs two health extension workers who are trained in about sixteen health topics and whose job is to go home to home in their community

tracking pregnant women, among other health issues. They encourage women to visit the nearest health center for at least one ANC visit. The Ministry of Health has also begun to organize volunteer groups (led by traditional birth attendants and other influential female leaders) called the Women Development Army, who also go home to home educating residents on women's health issues. Additionally, community and religious leaders are also recruited to reach out to women and their partners. All of these people are given color-coded referral cards instructing these women to go to the health center. Once turned in at the health center, these cards are used to track the most successful avenues through which these women are reached. At her first ANC visit, each pregnant woman is tested for HIV, unless she chooses to opt-out. If she tests positive, she is immediately put on ARV combination therapy. She is also given a referral card for her partner, asking him to come with his wife to the next ANC visit, though not mentioning HIV or that she tested positive. She is added to a wall tracking chart, which lists by anonymous number all of the HIV-positive women at the health center and tracks their visits through delivery. Lastly, she is connected with a Mother Support Group at the health center or in the community.

Mother support groups are led by two HIV-positive "Mentor Mothers" who are responsible for making sure all the members stay with the program for 52 weeks, or long enough for them to give birth and for their newborn children to have confirmatory HIV testing. The program addresses the psychological and social needs of the mothers. It also teaches them what they need to know about living with HIV and preventing transmission to their children. During their time as members of the group, the women are given lessons on different topics related to their phase of pregnancy or lactation. They also learn about adherence to ARTs, dual protection with their partners, nutrition and exclusive breast-feeding followed by mixed feeding. The program, based on a

Mother2Mother model developed in South Africa<sup>6</sup>, has been wildly successful. The women look up to their Mentor Mothers as examples of how to live successfully with HIV. Almost 95 percent of mothers deliver HIV-negative babies, and even after graduating from the program they often become involved in other community associations to create awareness about HIV.

*"Though we will not truly know whether all of these efforts to reduce vertical transmission and maternal and child mortality are working until the next demographic and health survey comes out in 2016, the signs are positive."*

The Ministry of Health is working to address the infrastructural issues as well. Since building the health centers, the Ministry has worked to provide blankets and beds where women can come to sleep the week of their expected delivery date. The Ministry has also supplied delivery room equipment, heaters, and ingredients for porridge and for the coffee ceremony. They have also received donations of "mama kits" from UNICEF, which contain a blanket, a knit cap, and two bars of soap for every mother.

Of course there are challenges with all of these efforts. Tracking mothers and babies can be onerous for health center staff. The quality of the data can be difficult to ensure. Data such as partner testing can be especially dubious when health center workers are merely taking the word of the pregnant woman that her partner was tested and is HIV-negative. Other issues such as staff turnover also have a huge effect on quality of care. When health center staff are assigned to remote areas, there is a high chance that they will want to transfer somewhere else at the first opportunity. With turnover comes gaps in training and inconsistency in care. Finally,

fluctuations in the health budget present additional problems. Since health centers do not make money on any services for pregnant women they can be hit hard if they are not making money elsewhere, particularly if the number of pregnant women they serve increases. When the health center lacks money, drugs will not be purchased, ambulances will not have fuel, and staff cannot be hired.<sup>7</sup>

The NGOs and the Ministry of Health are working to address these problems by consistently training health care workers to ensure that they are fully capable to counsel, test, treat and track all of the people in their catchment area. On a quarterly basis, health care workers are given refresher trainings and are evaluated through a joint supportive supervision mechanism. This involves the NGO, a representative from the district health office, and the health center manager going to each health center to examine the rooms and supplies, and giving hypothetical scenarios to the health care workers to assess their knowledge of correct procedure. At the end of the day all three offices sign off on the evaluation after discussing areas for improvement, who is responsible for them, and the date that those areas will be corrected.

Though we will not truly know whether all of these efforts to reduce vertical transmission and maternal and child mortality are working until the next demographic and health survey comes out in 2016, the signs are positive. By working on a small scale to ensure HIV-positive pregnant women are not lost to follow-up and that health care workers have the capacity to treat them, as well as on a large scale to ensure adequate infrastructure is available, the Ministry of Health aims to change the behavior of pregnant women in Ethiopia. If they are successful, the hope is that the prevalence of HIV will be reduced to that of many developed countries across the world.

*The opinions expressed in this article are the author's alone and are not meant to represent those of any agency mentioned within. However, this research and the work described to protect child survival, to end maternal deaths and birth injuries, and to prevent the transmission from mother to child of HIV is made possible by the US Agency for International Development (USAID) and the President's Emergency Program for AIDS Relief (PEPFAR). Thanks go to IntraHealth International for the opportunity to serve as an intern on their CPMTCT Project.*

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<sup>1</sup> No formal research has been done to substantiate these hypotheses explaining this reduced prevalence. The possible explanations listed here are merely the general observations of various health professionals with whom the author spoke.

<sup>2</sup> "Ethiopia Demographic and Health Survey 2011," Central Statistical Agency (Addis Ababa, Ethiopia and Calverton, Maryland, USA: ICF International, March 2012). <http://measuredhs.com/pubs/pdf/FR255/FR255.pdf>

<sup>3</sup> "Health Financing: Health Expenditure Ratios by Country," Global Health Observatory Data Repository, World Health Organization. <http://apps.who.int/gho/data/node.main.75>. Accessed September 3, 2013.

<sup>4</sup> The author spent two months, June-August 2013, in Ethiopia conducting interviews in the Addis, Oromiya, Amhara, SNNP, and Tigray Regions.

<sup>5</sup> "Ethiopia Demographic and Health Survey 2011," Central Statistical Agency (Addis Ababa, Ethiopia and Calverton, Maryland, USA: ICF International, March 2012).

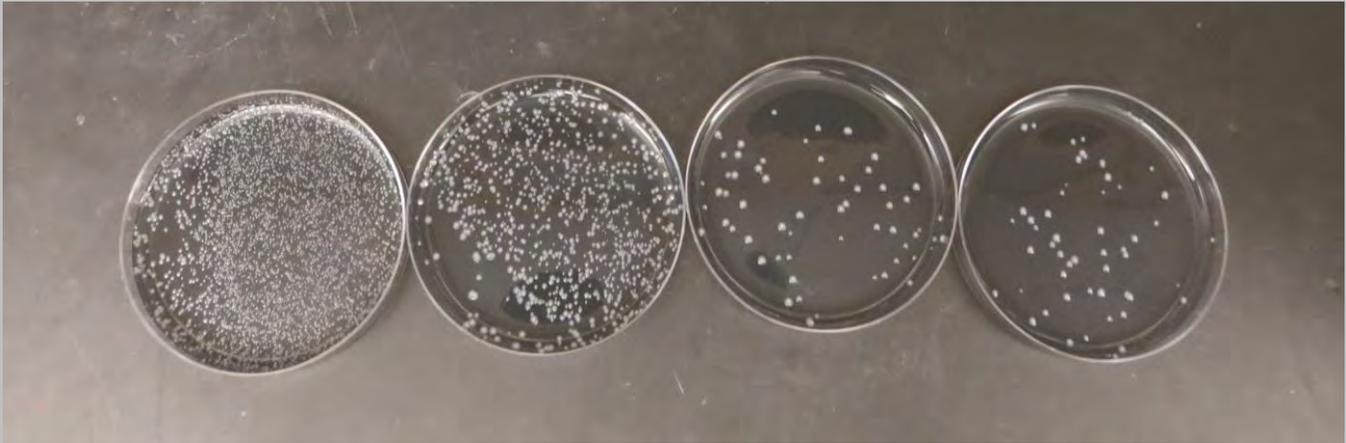
<sup>6</sup> Mothers2Mothers. <http://www.m2m.org/what-we-do/where-we-work/south-africa.html>. Accessed September 3, 2013.

<sup>7</sup> The Ministry of Health has introduced the health care financing system, wherein user fees are added to the budget the centers receive from existing federal and regional block grants. This helps them to manage their own budgets and address the problems that are most pressing at their site.

# Blazing New Trails with the Northwestern PhD/MPH Training Program:

## An Epidemiology of Pneumonia Study in Chicago

*Meghan Pearce received her PhD/MPH from the Driskill Graduate Program at Northwestern University in December 2011. She is currently a post-doctoral associate at Loyola University, Stritch School of Medicine, where she is investigating the prevalence and function of the human urinary microbiome.*



I chose to attend Northwestern for my graduate studies specifically for the combined PhD/MPH program. Having studied in a basic science laboratory as an undergraduate, I knew I enjoyed research. After receiving my bachelor's degree, I worked at the Centers for Disease Control and Prevention (CDC) as part of the Emerging Infectious Diseases laboratory training fellowship, which is where I officially caught "the public health bug." I loved science, I loved research, and I loved applying scientific principles to real-world problems. The PhD/MPH program was an obvious next step for me.

I became specifically interested in bacterial pathogenesis and thus my PhD thesis focused on *Legionella pneumophila*, the etiologic agent of Legionnaires' disease pneumonia. For my MPH culminating experience (CE), I wanted a project that incorporated my laboratory

training into a population-based study. Coincidentally, in 2009, the CDC initiated a multi-site prospective study to determine the population-based incidence and etiology of community-acquired pneumonia (CAP). My PhD advisor Dr. Nick Cianciotto and I learned of the CAP epidemiology study through collaborators at the CDC, who were eager to recruit someone with technical knowledge of *Legionella* to the study. My dual PhD/MPH training positioned me uniquely for this opportunity.

With the national incidence rate of legionellosis on the rise, the CDC wanted to ensure that *Legionella*, a bacterium that is difficult to culture, was carefully screened for in the study. This assignment required the skills of a PhD with advanced molecular genetics training as well as a thorough understanding of the public health context and implications. Thus the goal of my CE

study was to determine the contribution of *Legionella* to CAP in Chicago.

I started by traveling to the CDC to receive training on how to isolate and identify *Legionella* from clinical specimens. I took advantage of my brief time there to learn more about public health research and how it differs from academic basic science research. Whereas basic microbiology research traditionally focuses on bacteriology fundamentals, public health research at the CDC focuses on applying these basic science principles towards disease prevention for example by developing diagnostic assays to improve pathogen surveillance in the community.

While I was at CDC, an Epidemic Intelligence Service (EIS) officer had just returned from investigating a *Legionella* outbreak at the Playboy Mansion and I was able to sit in on a de-briefing meeting of the case. Having researched *Legionella* for over 4 years at this point, it was fascinating to link a biological understanding of the organism to disease transmission in a real outbreak. I was already learning how to apply basic science to public health and I had just barely started my CE.

*“The identification of the most prevalent etiologic CAP agents will guide clinical treatment protocols and provide rationale for increased research into the most clinically relevant pathogens.”*

Back in Chicago, I received additional laboratory training from the clinical microbiology laboratory at Northwestern under the direction of Dr. Kurt Reed. Along with principal investigators from the CDC, we performed site visits at the three participating Chicago hospitals. At each site, we spoke with

physicians, nurses, and clinical laboratory technicians regarding patient enrollment, specimen collection, and specimen processing. Based on their feedback, we defined the study laboratory operating procedures. At this point, I was gaining a better understanding of the fundamentals of prospective study design by seeing it firsthand.

*“We ultimately discovered that the isolate represented a novel species of *Legionella* which we named *Legionella cardiaca* meaning pertaining to the heart.”*

Over the course of one year, I screened all sputum and bronchoalveolar washes collected from study participants via culture and molecular-based assays for the presence of *Legionella*. In total, 698 CAP patients were enrolled in Chicago and *L. pneumophila* was identified as the etiologic agent in three cases. Chicago was just one site in the study and *Legionella* was just one of the etiologic agents screened. The study was still in progress when I graduated, but it was already clear then that a study of its magnitude would have an indelible impact on public health. The identification of the most prevalent etiologic CAP agents will guide clinical treatment protocols and provide rationale for increased research into the most clinically relevant pathogens. Analysis of the participant demographics and clinical history will also help assess and re-define CAP risk factors. Lastly, the large specimen and epidemiologic database will serve as an excellent source for retrospective studies, thereby fostering future research initiatives.

As a graduate student in the basic sciences, this study was my first opportunity to participate in population-based research. I was impressed by the scope of this multi-site

study and quickly realized the importance of effective communication across interdisciplinary teams. Study organizers frequently met to discuss the study progression and to analyze potential barriers. One challenge was ensuring that everyone was following the same enrollment protocol—a problem that was overcome by improved communication. Coming from a laboratory perspective in which most aspects of study design (right down to mouse model genotype) are controlled, I also gained a profound amount of respect for the difficulties associated with human research. For example, we frequently discussed strategies to increase participant recruitment and minimize loss to follow-up, two issues that don't normally affect basic scientists working on mouse models.

My experience with the CDC-initiated multi-state CAP project allowed me to connect with people across multiple disciplines. As a result of my collaboration with Dr. Reed at NMH, I became involved in an additional project independent of my CE. At one of our regular meetings, Dr. Reed mentioned that the clinical microbiology laboratory isolated *Legionella* from the heart of a patient undergoing aortic valve replacement—a peculiar finding considering *Legionella* is traditionally a lung pathogen and had not previously been isolated from a native heart. Out of curiosity, I

began investigating the genotypic, serologic, and phenotypic characteristics of this rare isolate. We ultimately discovered that the isolate represented a novel species of *Legionella* which we named *Legionella cardiaca*, meaning “pertaining to the heart,” and our findings were published in the *Journal of Clinical Microbiology* and the *International Journal of Systematic and Evolutionary Microbiology*. This interesting and fruitful side project would not have transpired if not for the connections made through my CE.

*“The future of innovation and public health progress lies at the intersection of multiple fields.”*

Overall, this experience allowed me to apply my basic science *Legionella* expertise toward the surveillance of community-acquired pneumonia and the identification of a novel clinically relevant species, truly melding my PhD and MPH interests. This opportunity and the discoveries made in the process might not have been possible with either path of training alone; together, they serve as a reminder that the future of innovation and public health progress lies at the intersection of multiple fields.

## About the NPHR LOGO

In 1854, John Snow persuaded one of London's local councils to disable the Broad Street pump. By proving that London's cholera epidemic was being spread through the water supply and then cutting off that source, Mr. Snow became one of the founders of public health. He changed the way we study and think about health and its all-encompassing grasp on a population. Today, we seek to protect public health through research, environmental programs, policy development, and system regulation. This journal encompasses the continuing research of a group of individuals inspired by Mr. Snow and his work to improve the health of many.

By Ashley Cenicerros, designer NPHR logo  
*Ashley Cenicerros is a third year MD/MPH candidate at the Feinberg School of Medicine*





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