

Yale Public Health

FALL 2015–SPRING 2016

The mathematics of disease

An evolving public health tool | Tracking Ebola's spread | Modeling concentration
Dean's departure | Amman Imman

$$T(n) = cn + sA(n) = cn + \frac{sk}{\sqrt{n}}$$

$$+(n_C - n_{\max}) \log \left(\sum_{i=2}^{C_{\max}-1} \beta P(i) \right)$$

$$T(n) = cn + sA(n) = cn + \frac{sk}{\sqrt{n}}$$

$$n^* = \left(\frac{sk}{2c} \right)^2$$

$$\sum_{w=w_0}^{w_f} \sum_{a=1}^{a_{\max}}$$

$$\left(-x_{a,w} + x_{a,w} \log x_{a,w} + \sum_{j=1}^{z_{a,t}} x_{a,w} \log j \right)$$

$$\sum_{t=t_v+y-1}^{t_v+y} \sum_a z_{a,t} / \sqrt{v_{a,t}}$$

$$TE_y = 1 - \frac{\sum_{t=t_v+52y}^{t_v+52(y-1)} \sum_a x_{a,t} / N_{a,t}}{\sum_a V_{a,t} x_{a,t}}$$

$$DE_t = \frac{\sum_a V_{a,t} x_{a,t}}{\sum_a x_{a,t}}$$

$$R_j = \sum p_{ij}$$

$$p_{ij} = \frac{g(t_i - t_j)}{\sum_{i \neq j} g(t_i - t_j)}$$

$$l(N, n_C, C_{\max}, n_{\max} | R_0) = k + (N - n_C) \log(P(1 | R_0))$$

$$-(n_{\max}) \log \left(\sum_{i=2}^{C_{\max}-1} P(i | R_0) \right) + n_{\max} \log(P(C_{\max} | R_0))$$

Yale Public Health

FALL 2015–SPRING 2016

2 **Dean's Message**

3 **Editor's Note**

4 **Advances**

12 **The mathematics of disease**

Researchers are using complex calculations to better understand – and prevent – the spread of various diseases.

16 **Calculating Ebola**

At the height of a deadly epidemic, YSPH researchers develop a model that sheds light on the transmission patterns of the virus.

19 **Deterring assaults**

An epidemic of sexual violence in South Africa's townships can be significantly reduced, and mathematical modeling shows how.

22 **A conversation with Reza Yaesoubi**

24 **Modeling concentration launched at YSPH**

A new program at the Yale School of Public Health will provide students with public health modeling skills.

26 **Dean steps down**

A look at the many accomplishments of Dean Paul Cleary, who is stepping down after 10 years.

29 **Student-alumni mentorship program flourishes**

A Yale School of Public Health program pairs aspiring health professionals with specialists in the field.

32 **Students**

36 **Alumni**

41 **YSPH Notes**

54 **In Memoriam**

56 **Today**

Yale SCHOOL OF PUBLIC HEALTH



Dean's Message

Modeling's promise

Disease modeling is increasingly important to the science, practice and advancement of public health, and there are few places today with the same breadth and depth of talent in this field as the Yale School of Public Health.

In this issue of *Yale Public Health*, you will read about the potential of modeling to predict the course of disease outbreaks and the optimal public health response to reduce human death and suffering. Our researchers, including doctoral students, did this most remarkably during the Ebola outbreak in Western Africa in 2014 that devastated several countries and threatened other regions of the world.

Alison Galvani, the Burnett and Stender Families Professor of Epidemiology, and her research group published a series of papers during the crisis that revealed important information about Ebola's transmission and how its spread might be slowed.

Dr. Galvani is a pioneer in the field of disease modeling and has addressed diseases as varied – and deadly – as rabies, influenza, TB, HPV, HIV, rotavirus and, more recently, Zika. When she received a named professorship in 2015, she was the youngest person in the history of the school of medicine to receive such an honor. Thankfully, she has decades of productive work years ahead of her.

The Yale School of Public Health also has created a modeling concentration that addresses growing student demand in this area. We have an exceptional team of talented faculty who will work with students in a variety of modeling areas and are helping to create future public health leaders in this field.

I agree with A. David Paltiel, professor of public health and the concentration's director, who has

observed that modeling is emerging as a “third pillar” of public health research, alongside traditional strategies of analyzing observational data and experimentation. The Yale School of Public Health recognizes the potential benefits of this approach, which we think will be critical to creating public health solutions for the 21st century.

A personal message

On a personal note, I will soon be stepping down after two terms, or 10 years, as dean. This was a difficult decision for me. I have truly loved and benefitted from my tenure as dean and am inspired daily by the passion, commitment and vision that I witness throughout the Yale School of Public Health community.

I have never worked with a better group of people, and it was a privilege to participate in the development and growth of this great school and to help shape its future. The school will continue to be a leader this century in addressing the pressing – and growing – public health challenges that face us all. The Yale School of Public Health has worked for 101 years to improve lives, and going forth I know that it will continue to advance the health of people in communities throughout the world. I am confident that the next dean will take the school to still greater heights.

A heartfelt thank you to everyone at the school, university and beyond for the past 10 years and all that you have contributed to public health at Yale. You have my gratitude.

Paul D. Cleary, Ph.D.

Dean, Yale School of Public Health

“

There are few places today with the same breadth and depth of talent in this field as the Yale School of Public Health.

”

Editor's Note

Centennial revisited



Yale Public Health

The Journal of the Yale School of Public Health
Fall 2015–Spring 2016, Vol. 7, No. 2 | Vol. 8, No. 1

Dean

Paul D. Cleary, Ph.D.
The Anna M.R. Lauder Professor of Public Health

Managing Editor

Michael A. Greenwood

Copy Editor

Anne Sommer

Design

AH Design, Angie Hurlbut
NYM Design, Nilou Moochhala

Contributors

Denise L. Meyer, Jennifer Kaylin

Address correspondence to

Managing Editor, *Yale Public Health*
47 College Street, Suite 104
P.O. Box 208034
New Haven, CT 06520-8034
Phone: 203-737-5151
Fax: 203-785-7296
E-mail: michael.greenwood@yale.edu
Web: publichealth.yale.edu

Yale Public Health is published twice a year and is distributed to alumni, faculty, students and friends of the Yale School of Public Health.

Acronyms used in *Yale Public Health* include YSPH for Yale School of Public Health and LEPH for Laboratory of Epidemiology and Public Health (the school's main building).

Cover art by Michael Woloschinow

Printer

Pyne-Davidson Co.



Printed on recycled paper
with soy-based inks

Follow the Yale School of Public Health on
Facebook, Twitter and LinkedIn.



A digital archive of *Yale Public Health* is available at
publichealth.yale.edu/news/magazine/index.aspx.

The *Yale Public Health* double issue (Fall 2014–Spring 2015) celebrating the school's centennial was a major undertaking, but a very worthwhile one. For many of our readers, the photo essay, in particular, hit home (see below).

The 112-page issue featured scores of candid and original images of many of the people associated with the Yale School of Public Health and the important work that is done in classrooms, laboratories and the field. Over a 12-day period, several very talented photographers captured the School of Public Health at 100 and, more importantly, the vitality and future of public health at Yale as the school passed a major milestone.

Some readers said that they wanted more, such as more information about the school's history or more photos related to particular people and topics. Putting together an issue as large as this is always a challenge, but I will keep these requests in mind as we plan future issues of *Yale Public Health*.

Michael Greenwood
Managing Editor

Congratulations

The double issue is absolutely beautiful and inspiring. Congratulations to you and the team at YSPH.

Ann Greene
Community Research Liaison
Robert Wood Johnson Foundation
Clinical Scholars Program

Bravo Zulu

Thank you so much for assembling and publishing such a spectacular work!

The photographs, the visions depicted, the personalities, projects and good friends between the covers of this issue bring back the wonderful times and memories of my journey to a Master of Public Health within the walls of the building.

This is a collection of history and memories that I will revisit many times over the next years. It shows well our roots in the academic community of Yale, as well as the importance of the school's efforts and outputs in the field and the practice of public health in our state, the United States and the world. We see in our current students the future of our profession as well. This issue provides us with topics of discussion for future efforts and confirms in my mind that we have taken "a right path" both as individuals and as a collaborative.

To the people who helped develop and synthesize the content of this issue, Bravo Zulu ("Well Done!").

To the School of Public Health, the faculty, staff and denizens thereof, both past and present: Thank You.

Charles I. Motes Jr.
M.S., M.P.H. '88

HIV medication offers protection against malaria

African children with HIV/AIDS are at a greater risk for malaria, but those who take certain HIV medications gain protection against malaria infection, a team of Yale School of Public Health researchers has discovered.

Researchers led by Sunil Parikh, M.D., M.P.H., assistant professor in the Department of Epidemiology of Microbial Diseases, found that the use of protease inhibitor-based antiretroviral therapy for HIV is effective in reducing malaria in HIV-infected children in most regions of sub-Saharan Africa, where both HIV and malaria are widespread.

Using clinical data from a high-transmission area of Uganda, the team determined that HIV protease inhibitors could prevent anywhere from 278 to 1,043 episodes of malaria per 1,000 children each year.

Parikh had previously shown that HIV protease inhibitors are able to kill malaria parasites grown in the laboratory. Following up on these findings, the researchers hypothesized that children who receive protease inhibitor-based antiretroviral therapy would be protected against malaria as well. The hypothesis was tested in an area of Uganda where HIV and malaria are prevalent. They found an approximately 40 percent reduction in malaria in children who were on HIV protease inhibitor regimens.

Parikh's team said that the anti-malarial protection in HIV patients is due to a beneficial "drug-drug interaction" between the protease inhibitors and the anti-malarial drug, artemether-lumefantrine. "This was an exciting translation of bench

science to the field, particularly because we could impact two major diseases with the same drug regimen," Parikh said.

The study was published in the journal *AIDS*.

Michael Greenwood

Lyme pathogen linked to emerging tick disease

Mice that are already infected with the pathogen that causes Lyme disease appear to facilitate the spread of a lesser-known but emerging disease, babesiosis, into new areas, research led by the Yale School of Public Health has found.

Using laboratory experiments, mathematical models and fieldwork data, researchers discovered that mice infected with the agent that causes Lyme disease (*Borrelia burgdorferi*) are at increased risk for also transmitting *Babesia microti*, the pathogen responsible for babesiosis, and could be enhancing the geographic spread of this emerging disease. Both diseases are transmitted to humans through the bite of infected blacklegged ticks (*Ixodes scapularis*).

"Ticks and natural hosts are commonly co-infected in nature, so understanding how these pathogens may influence each other's abundance and distribution is key for public health," said Maria A. Diuk-Wasser, Ph.D., senior author of the study and a former associate professor at the school.

There are approximately 30,000 new Lyme disease cases reported each year, and 95 percent of these are reported from 14 states, primarily on the East Coast and in the Midwest. Babesiosis is found in similar



regions as Lyme disease, but the vast majority of cases are concentrated in the seven core Lyme disease states (Connecticut, Massachusetts, New Jersey, New York, Rhode Island, Minnesota and Wisconsin). About 1,000 new cases of babesiosis are reported annually.

While the two diseases share some of the same symptoms, babesiosis can be fatal in immunocompromised patients and can be transmitted through blood transfusions as well as tick bites. This poses an additional public health threat.

The study was published in the journal *PLOS One*.

M.G.

Obesity widespread in the Pacific Islands

Obesity and diabetes have reached pandemic levels in the Pacific Islands, where the rates of obesity and type 2 diabetes are among the highest in the world. In some areas, body mass index has risen at five times the worldwide rate over the past 30 years alone.

The cause is common globally, according to Yale School of Public Health researcher Nicola Hawley, Ph.D., assistant professor in the Department of Chronic Disease Epidemiology. American Samoa, for example, was a traditional subsistence society reliant on local produce and manual labor. Then modernization introduced a high-fat diet and more sedentary occupations, Hawley said. Now, nearly 94 percent of adults are overweight or obese, and 47 percent have diabetes.

There are also some region-specific causes, Hawley said. Indigenous foods, like fish and yams, have become expensive and have been replaced, in some places almost entirely, by imported and highly processed foods. These are often of poor quality and include high-calorie snack food and fatty cuts of meat, such as turkey tails and lamb flaps, that are waste products, considered unfit for human consumption in other regions. Local tradition also presents challenges. Food is of great cultural importance, and larger body size is associated with beauty and wealth. Also, local health care systems are overburdened with other medical needs, such as treating communicable diseases.

Progress is being made, Hawley said, including small-scale programs to reduce obesity and control diabetes. Meanwhile, the plight of the Pacific Islands holds lessons for other parts of the world. “There are many other societies that are experiencing a similar transition,” Hawley said.

The paper was published in the journal *Current Diabetes Reports*.

Jeanna Lucci-Canapari

Frequent plasma donations making people sick

Unlike donors of whole blood, blood plasma donors in China are compensated in much-needed cash, which in turn is causing health problems among the rural poor.

A Yale School of Public Health-led study reveals how members of farming families in western China who use commercial blood plasma donation to supplement their income suffer from an increased risk of

infectious disease and general poor health.

“Some need cash to send children to school. Some need money to build fancy houses to attract potential brides, as the marriage market is tightening,” said Xi Chen, M.S., Ph.D., assistant professor in the Department of Health Policy and Management.

Privatized blood banks fall outside the scope of government regulation, meaning that they don’t consistently follow standardized hygienic procedures. Often, Chen said, they ignore sterilization and share centrifuge machines and needles among patients without checking for viruses. This has caused an increase in infectious diseases, such as HIV/AIDS and hepatitis C.

Most of the donors are women, and incentives to donate frequently (as often as twice a month) have left some weak and prone to illness. Though donors know that donating blood plasma is dangerous for many, the financial incentives are too great to ignore. There is a high demand for blood plasma, which is sold to pharmaceutical companies. Chen plans to continue this study to answer additional questions.

The study was published in the journal *Health Economics Review*.

J. L.-C.

Elderly benefit from positive, subliminal stereotypes

Elderly people who are subjected to positive stereotypes about aging showed improved physical functioning that can last for several weeks, a study led by the Yale School of Public Health has found.



Michael Weloschnow (2)

Researchers used a novel intervention method to examine whether exposure to positive age stereotypes could weaken negative age stereotypes and lead to healthier outcomes. They examined 100 people, averaging 81 years old. Some were shown positive age stereotypes on a computer screen that flashed words such as “spry” and “creative” at speeds that were too fast to allow for conscious awareness. Test subjects exposed to the positive messaging exhibited a range of psychological and physical improvements that were not found in control subjects. Improved physical function, such as balance, continued for three weeks after the intervention ended. Also, positive age stereotypes and positive self-perceptions of aging were strengthened.

“The challenge we had was enabling the participants to overcome the negative age stereotypes that they acquire from society, as in everyday conversations and television comedies.”

—Becca Levy

“The challenge we had was enabling the participants to overcome the negative age stereotypes that they acquire from society, as in everyday conversations and

television comedies,” said lead researcher Becca Levy, Ph.D., associate professor in the Department of Chronic Disease Epidemiology. “The study’s successful outcome suggests the potential of directing subliminal processes toward the enhancement of physical function.”

While it’s previously been shown by Levy that negative age stereotypes can weaken an older person’s physical functioning, this is the first time that subliminal activation of positive age stereotypes was found to improve outcomes over time.

The study was published in the journal *Psychological Science*.

Michael Greenwood

Light drinking while pregnant may not be harmful

Low to moderate alcohol consumption by pregnant women is not associated with an increased risk for specific birth outcomes and measures of fetal growth.

Research led by the Yale School of Public Health investigated the effects of lower levels of alcohol consumption on 4,496 women and non-multiple-birth infants.

National guidelines recommend abstaining from alcohol during pregnancy, but many women drink low to moderate amounts, often before realizing they are pregnant. The team found that for women who drank low to moderate amounts of alcohol in early pregnancy, there was a reduced likelihood of low birth weight, short birth length and small head circumference.

“While this study and others find no evidence of harm from low to moderate alcohol consumption, more

research is needed to investigate this contradiction,” said senior author Michael B. Bracken, M.P.H. ’70, Ph.D. ’74, the Susan Dwight Bliss Professor of Epidemiology.

The study was published in the journal *Annals of Epidemiology*.

M.G.

Laser accurately measures fruit, vegetable intake

A diet rich in fruits and vegetables is linked to good health, but measuring consumption through self-reporting, especially by children, is of questionable validity. A laser device under development by researchers at the Yale School of Public Health and colleagues elsewhere may address this.

The device uses a blue laser light to quickly and painlessly scan the subject’s palm, accurately measuring changes in a biomarker known as skin carotenoids in response to an intervention involving a diet rich in fruits and vegetables. The study tracked carotenoid changes over a 28-week period that was divided into distinct dietary phases marked by high and low intake of provided fruits and vegetables, as well as a phase in which participants resumed their usual diets.

The palm-reading device uses resonance Raman spectroscopy and works by measuring changes in energy levels of electrons in molecules after the laser has excited them. A flexible fiber optic probe connected to a boxlike central machine is held against an individual’s palm for approximately 30 seconds while the light interacts with the carotenoids in the skin. Then, software on an attached laptop processes the results, which takes another 30 seconds.



“There is great interest in the development of objective biomarkers of dietary intake, especially biomarkers that can measure non-invasively,” said Susan T. Mayne, Ph.D., the C.-E.A. Winslow Professor of Epidemiology, one of the study’s authors and a developer of the device.

Subjective methods of measuring fruit and vegetable intake, such as questionnaires, are prone to bias and error, but measuring carotenoids in the blood provides an accurate result.

The study was published in *The American Journal of Clinical Nutrition*.

M.G.

Helping children with respiratory syncytial virus

Respiratory syncytial virus, or RSV, is the most common cause of bronchiolitis and pneumonia in the United States in children under the age of one. Yale researchers have found that a preventative therapy, consisting of five injections of a prophylaxis that covers a region’s RSV season, helps.

A team of researchers led by Daniel M. Weinberger, Ph.D., assistant professor in the Department of Epidemiology of Microbial Diseases, discovered that if timed correctly, five doses of the prophylaxis can be cut to four, sparing the child pain and saving the family money.

“Like many diseases, RSV epidemics follow a bell-shaped curve, with most cases falling in the middle of the epidemic,” said Weinberger. “Protecting children during the middle period is going to be most important, even if the child is

protected for a shorter time overall.” The virus causes cold-like symptoms, but for premature infants and children with underlying cardiopulmonary conditions, the virus can be more dangerous.

Currently, the prophylaxis is given according to guidelines set by the American Academy of Pediatrics, which doesn’t take into account regional variation in the onset of RSV epidemics.

The YSPH researchers analyzed hospitalization data from 38 states

“Like many diseases, RSV epidemics follow a bell-shaped curve, with most cases falling in the middle of the epidemic.”

—Daniel Weinberger

to learn the timing of local RSV epidemics. They found that 90 percent to 98 percent of cases occurring within the 24-week window of protection also occurred during the optimal 20-week window, as determined by the typical onset of the epidemic. This led researchers to conclude that the prophylaxis would be more effective using state-specific guidelines, rather than a general national recommendation.

The findings were published in the journal *Clinical Infectious Diseases*.

Jeanna Lucci-Canapari

Energy drinks associated with behavioral problems

Middle school children who drink heavily sweetened energy drinks are 66 percent more likely to be at risk for hyperactivity and inattention symptoms.

Researchers led by Jeannette R. Ickovics, Ph.D., director of CARE (Community Alliance for Research and Engagement) at the Yale School of Public Health, surveyed 1,649 middle school students from an urban school district in Connecticut. They found that boys were more likely to consume energy drinks than girls and that black and Hispanic boys drank the beverages more often than their white peers.

Previous research has found a strong correlation between children with attention deficit hyperactivity disorder and poorer academic outcomes, more difficulties with peer relationships and more injuries than their peers. These associations are understudied and underdiagnosed among minority children.

Some sugar-sweetened beverages and energy drinks contain up to 40 grams of sugar. Students in the study consumed an average of two sugared drinks a day, with a range of zero to seven or more drinks. In addition to their role in contributing to hyperactivity and inattention, heavily sugared drinks also contribute to childhood obesity.

“As the total number of sugar-sweetened beverages increased, so too did the risk for hyperactivity and inattention symptoms among our middle school students,” said Ickovics. “Importantly, it appears that energy drinks are driving this association. Our results support the American Academy of Pediatrics’ recommendation that



Michael Woloschnow (2)

parents limit consumption of sweetened beverages and that children not consume any energy drinks.”

The study was published in the journal *Academic Pediatrics*.

M.G.

“As the total number of sugar-sweetened beverages increased, so too did the risk for hyperactivity and inattention symptoms among our middle school students.”

—Jeannette Ickovics

Women ignore heart attack symptoms, delay help

Younger women may ignore or dismiss the earliest symptoms of an impending heart attack, such as pain and dizziness, and they tend to delay seeking emergency medical care, leading to a disproportionately high death rate among young women compared to that for similarly aged men.

Yale School of Public Health researchers examined the experiences of women, aged 30 to 55, who were hospitalized with acute myocardial infarction. They asked the women how they responded when their first symptoms manifested and they were deciding whether to seek medical care.

The researchers found that initial symptoms varied widely. Patients inaccurately assessed their risk of heart disease, with factors such as work and family obligations influencing their decision about whether or not to seek emergency medical care.

“Identifying strategies to help women recognize symptoms and seek prompt care is critical for young women at increased risk for heart disease.”

—Judith Lichtman

“Young women with multiple risk factors and a strong family history of cardiac disease should not assume that they are too young to have a heart attack,” said lead researcher Judith H. Lichtman, M.P.H. ’88, Ph.D. ’96, associate professor in and chair of the Department of Chronic Disease Epidemiology. “Participants in our study said they were concerned about initiating a false alarm in case their symptoms were due to something other than a heart attack.”

Heart disease is the leading cause of death among women in the United States under the age of 55, claiming the lives of more than 15,000 women a year.

“Identifying strategies to help women recognize symptoms and seek prompt care is critical for young women at increased risk for heart disease,” said Lichtman.

The study was published in the journal *Circulation: Cardiovascular Quality and Outcomes*.

Michael Greenwood

Extent of *C. difficile* infections is calculated

A recent national study estimates that the germ *Clostridium difficile*, known as *C. difficile*, caused nearly half a million infections in the United States in a single year, with 29,000 people dying from the exposure.

The report relies on population-based surveillance data from 10 Emerging Infections Program (EIP) sites nationwide, including one at the Yale School of Public Health.

Because prior data on the disease identified only health care-associated cases, the new data are able to show the significant extent of *C. difficile* infection in the community. Though 66 percent of reported cases are health care-associated, only 24 percent of total cases occurred within hospitals, with the rest, nearly 200,000, occurring in nursing homes or elsewhere in the community.

C. difficile causes severe diarrhea and is the leading cause of gastroenteritis-related death in the United States. It is also the most common cause of health care-related infections. Eighty percent of deaths occur in adults 65 and older. Unnecessary antibiotic use, improper cleaning procedures and a lack of coordination in hospital transfers contribute to the spread of *C. difficile* in acute care settings.

Antibiotic use is the most important risk factor for *C. difficile* infection, as well as the



Michael Woloschinow

over-prescription of broad-spectrum antibiotics, which kill both targeted bacteria and beneficial bacteria that may protect against *C. difficile* in acute care settings.

James Meek, associate director of the Yale EIP, said cases of health care-associated *C. difficile* are dropping in Connecticut, possible evidence that infection control measures are working. However, Meek said, the report’s information about the prevalence of *C. difficile* in the community suggests that “we may need to extend our prevention efforts to new arenas, such as long-term-care facilities, nursing homes and outpatient settings.”

Jeanna Lucci-Canapari

“We may need to extend our prevention efforts to new arenas, such as long-term-care facilities, nursing homes and outpatient settings.”

—James Meek



Thank you!

Our centennial celebration in 2015 was so much fun that we're now looking forward to our bicentennial!

On behalf of the Yale School of Public Health, I wish to thank everyone who participated in our yearlong celebration and made it so special. I am confident that our next 100 years will be as successful and productive as our first.

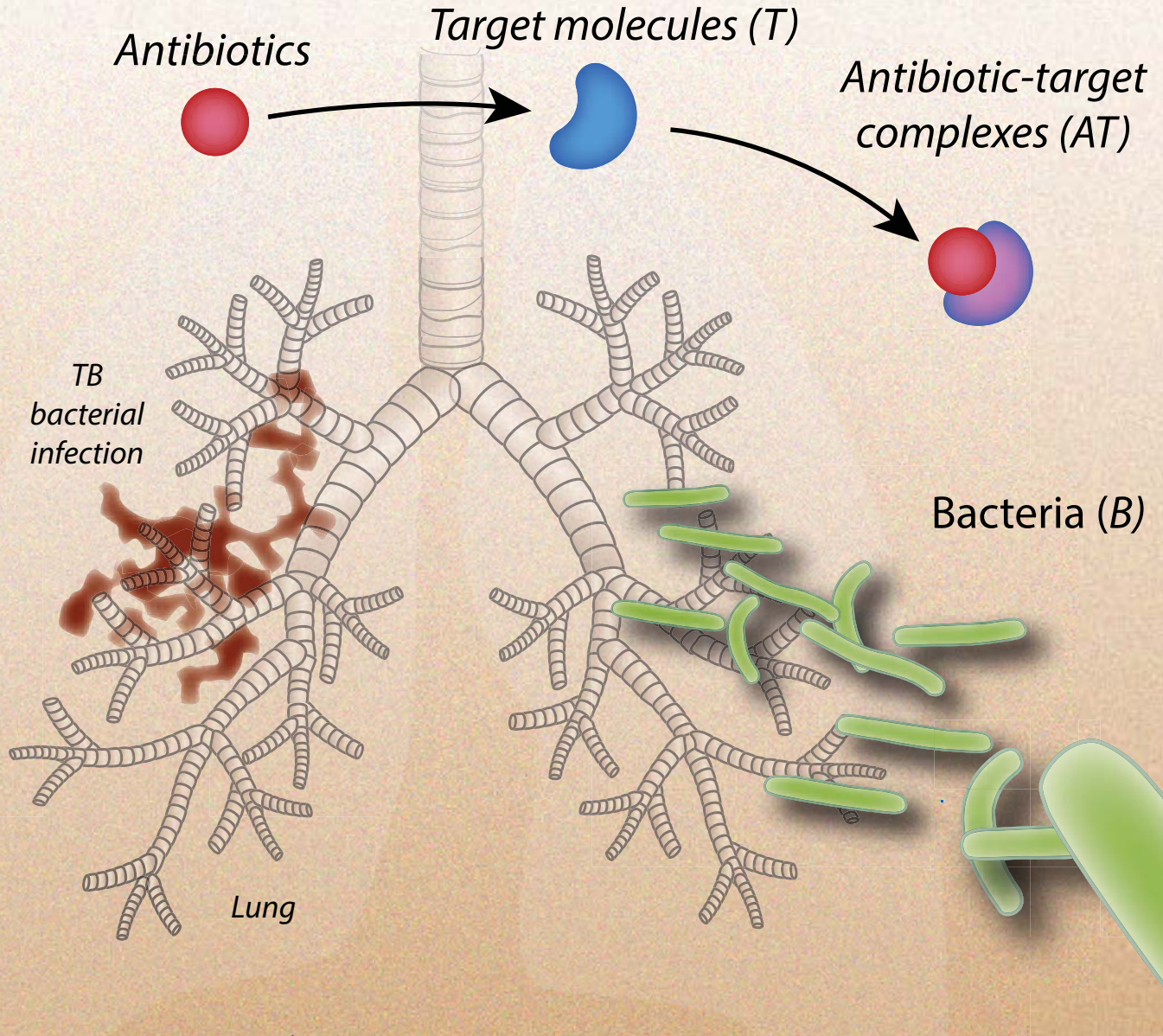
— DEAN PAUL CLEARY



Disease Modeling

Although antibiotics were introduced more than 70 years ago, considerable uncertainty remains about how the drugs should be used to ensure patient recovery while also minimizing toxic side effects and the risk of developing antibiotic resistance.

Current mathematical models predict the effect of antibiotics on bacteria in specific settings but fail to reliably predict treatment efficacy across a range of biologically relevant scenarios.



Growth depends on the intrinsic growth rate (r), the fraction of bacterial target molecules (T) that are bound up into antibiotic-target complexes (AT), the existing number of bacterial cells (B) and the maximal number of bacteria that can be present (K) in the host.

Ted Cohen, M.D., M.P.H., D.P.H., associate professor at the Yale School of Public Health, and Pia Abel zur Wiesch, Ph.D., then a post-doctoral fellow at the school, and colleagues designed the model below that uses information about how antibiotics bind to bacterial target molecules to predict how these drugs will affect individual bacterial cells and populations of bacteria. It suggests that antibiotic action may be explained by the simple chemical kinetics of antibiotics binding to bacterial targets.

The model may eventually help inform the design of more effective antibiotic dosage regimens based on the chemical kinetic properties of antibiotics alone. Furthermore, it may be useful for speeding the development of new antibiotics by identifying favorable chemical kinetic characteristics of new drug compounds. The findings were published in the journal *Science Translational Medicine*.

The change in the number of bacteria (B) over time (t) equals

Growth

minus

Death

$$\frac{\delta B}{\delta t} = r \left(\frac{[T]}{[AT] + [T]} \right) B \left(1 - \frac{B}{K} \right) - d \left(\frac{[T]}{[AT] + [T]} \right) B$$

Death depends on the intrinsic death rate (d), the fraction of bacterial target molecules (T) that are bound up into antibiotic-target complexes (AT) and the existing number of bacterial cells (B).



THE MATHS THEN OF

Yale School of Public Health researchers harness numbers to predict and prevent the spread of epidemics.

By Steve Kemper

Among the newer weapons being used against disease, most people would not expect to find differential equations. Yet sophisticated math is at the heart of a relatively young field within public health known as disease modeling.

“We represent the key components of disease transmission in mathematical equations,” said Alison P. Galvani, Ph.D., the Burnett and Stender Families Professor of Epidemiology, professor of ecology and evolutionary biology and director of Yale’s new Center for Infectious Disease Modeling and Analysis (CIDMA). These key components might include data from epidemiology, medical clinics, economics, ecology, biostatistics, psychology and game theory, as well as demographics about the specific location beset by an infectious disease. All of these data get converted into equations and fed into supercomputers that may produce millions of simulations, using the information to test various possibilities and assumptions. The scientists eventually refine these computerized experiments into a prognostic model.

“Modeling allows us to forecast the trajectories of disease transmissions,” said Galvani, “and to design solutions to address public health challenges. It can be a very powerful predictive tool.”

The power of modeling

Galvani has used such modeling to forecast how, and how fast, infectious illnesses such as flu and tuberculosis, HIV, human papillomavirus (HPV), rotavirus, sleeping sickness, rabies, Ebola and, more recently, Zika, are likely to spread in stricken areas, as well as the best options for stopping or preventing them.

“I find it exciting to use modeling to inform policy decisions that save and improve lives,” she said.

The expanding potential of disease modeling, combined with Galvani’s growing prominence in the field, led to the establishment in May 2014 of CIDMA. (Galvani has published more than 160 journal articles and in April 2015, at age 38, she became the youngest person ever to receive a named professorship at the Yale School of Medicine.) The center has since grown quickly, attracting about 20 international scientists with a shared goal of producing research that leads to better, cost-effective strategies for fighting infectious diseases and also to better public health policies.

One of Galvani’s early successes came in 2009, when she and colleagues challenged the policy recommended by the Centers for Disease Control and Prevention (CDC) to prevent flu, which focused on vaccinating the elderly. Galvani’s team showed that this approach failed to consider the dynamics of flu transmission. Their model indicated that the infection spreads primarily through clusters of people, especially in households and schools, not through random individuals.



MATHEMATICS DISEASE

“I find it exciting to use modeling to inform policy decisions that save and improve lives.” –Alison Galvani

It also predicted that health officials could reduce infections, hospitalizations and deaths by focusing vaccination programs on schoolchildren and parents. (In 2014, CIDMA researchers joined other Yale scientists to predict a similar cluster pattern of transmission in West Africa’s Ebola epidemic. See story on page 32.) The CDC subsequently shifted its policy, recommending that children be vaccinated to reduce transmission.

Cost-effectiveness

In developing countries, cost-effectiveness is as critical as understanding the dynamics of transmission. Health ministries and nongovernmental organizations are increasingly turning to disease modeling for answers. Recently, Galvani’s team developed a model for Tanzania, which predicted that the most cost-effective prevention for rabies would be not to vaccinate humans but to vaccinate dogs, the main source of the infection. When a rabid dog bites someone, the treatment costs about \$20, whereas dogs can be vaccinated for about a penny – and vaccinated dogs don’t spread rabies. Based on this research, India’s Public Health Foundation is also considering a vaccination program for dogs.

Though human vaccinations are often the best way to prevent transmission of disease, they are sometimes resisted for reasons unrelated to science or medicine. Consider the persistent but false belief that childhood vaccines can cause autism. Any disease model, said Galvani, must factor in how humans might behave. A few years ago she co-authored a paper titled “Social Factors in Epidemiology,” which noted, “Ideas, sentiments or information can also be contagious,” leading to epidemics of bad information and poor choices that worsen the risk of disease.

She points to HPV as an example. Since 2008 there has been an excellent vaccine against this sexually transmitted infection. The public health goal was to vaccinate 67 percent of female adolescents. Yet because of a perception that the vaccination would make adolescents more sexually promiscuous, a perception without basis, Galvani’s model predicted that many parents wouldn’t allow their daughters to get the vaccine. Her model predicted a vaccination rate among female adolescents of 32 percent. The most recent figures indicate that the rate of vaccination has plateaued at 33 percent. “A policy is only as optimal as the extent to which you can implement it,” said Galvani.

Around the peak of the Ebola outbreak in West Africa, a modeling study published by Galvani and her team in *Science* suggested that the outbreak could be controlled within six months if specific measures could be concomitantly implemented, including hygienic burials of victims and isolation of infected individuals. “At the time, I had the feeling that our predictions were optimistic. However—fortunately—when the recommended interventions were implemented in Liberia, the curbing of the outbreak matched our projections remarkably closely.”

Informing policy

Virginia E. Pitzer, Sc.D., assistant professor of epidemiology, does disease modeling primarily of typhoid and rotavirus, which is the most common cause of diarrhea in children and responsible for killing about 450,000 kids worldwide each year prior to vaccine introduction. She has been working with the CDC to better understand the unforeseen effects of the rotavirus vaccine.

“When you vaccinate infants,” she said, “you also stop a lot of the transmission to people who are caring for them and changing the diapers, so there’s been a pretty strong indirect effect on the overall epidemiology. In 2009 we predicted that when vaccine coverage reached around 80 percent, the epidemics would happen every two years instead of annually. Sure enough, the epidemics are now much smaller and occur every two years in the United States.”

New typhoid vaccines are also coming online, and Pitzer is making disease models to see how these vaccines should be used, which age groups should be targeted and what the best strategies are for eliminating the infection. The work is helping to inform policy recommendations for the World Health Organization and the Bill & Melinda Gates Foundation. “It’s about figuring out how to make the most of whatever data are available,” said Pitzer.

Supercomputers and the proliferation of data have made disease modeling faster and more accurate, but Pitzer cautions that they can also become ends in themselves, leading to overcomplicated, less useful models. She looks for the key factors of transmission and tries to determine what they are, partly through a dialogue with field and clinical researchers, microbiologists, pathologists and epidemiologists. “They’re out there collecting data that are essential for informing the models,” she said, “and it’s really important to continually test the models against data.” It’s also essential to collaborate with experts outside the field, such as economists, psychologists and sociologists. Policymakers within individual countries are also crucial collaborators because of their contextual knowledge. Their insights can refine the models and correct flawed assumptions. Equally important, they can help turn the models’ predictive results into programs and policies.

Disease modeling is beginning to benefit from so-called big data, collected from cell phones, for instance, or sequence-level data from infected patients. The cell phone data are being used to track malaria transmission in Africa. “By understanding how people move within countries or between countries,” said Pitzer, “you can evaluate what the risk might be of the pathogen moving with those people.”

“It’s about figuring out how to make the most of whatever data are available.” —Virginia Pitzer



Alison Galvani (center, standing), the Burnett and Stender Families Professor of Epidemiology, with members of her Center for Infectious Disease Modeling and Analysis research team. The center, established in 2014, focuses on creating better, cost-effective strategies for fighting infectious diseases and improving public health policies through disease modeling.

“With modeling, we can test a series of possible interventions.”

—Albert Ko

Field epidemiology

Albert I. Ko, M.D., professor in and chair of the Department of Epidemiology of Microbial Diseases, comes at disease modeling from the perspective of a field epidemiologist. “We collect data, whereas in mathematical modeling you’re producing data,” he said. “It’s a very different approach and can be a novel pathway, with the caveat that it’s best when done together with field studies that are validating the mathematical models.”

Modeling, he says, can help field epidemiologists overcome certain limitations. He works primarily on leptospirosis in urban slums, particularly in Brazil. Rats, which shed the bacteria, transmit the disease, and then humans pick it up in the environment. Epidemiologists call this a “spillover” infection. Ko is using disease modeling in combination with field studies to understand the dynamics of leptospirosis infection.

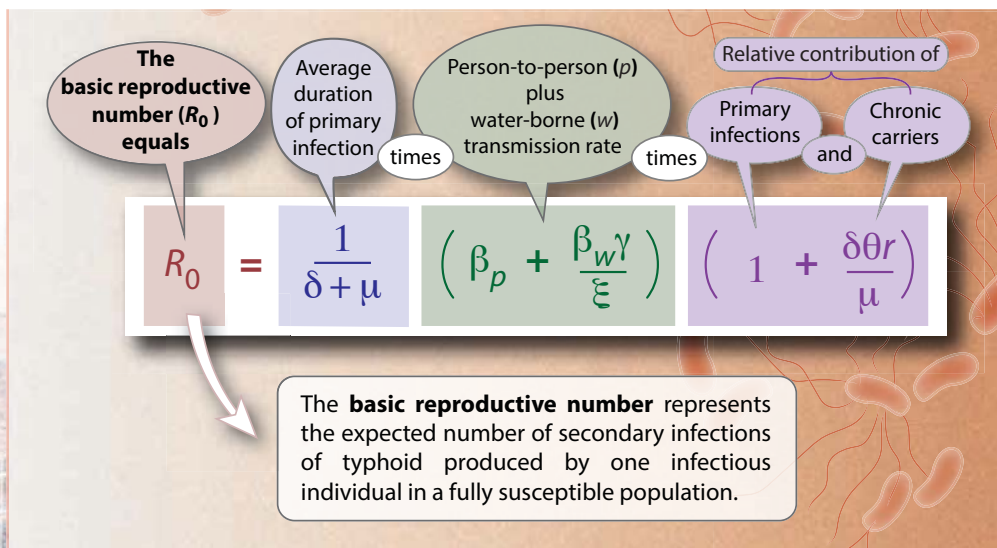
“With modeling, we can test a series of possible interventions,” he said. What might be best in terms of rat control? If the population of rats is reduced by a certain amount, how many cases of leptospirosis will be averted? If open sewers are eliminated, what might be the relative impact?

“If we had to go out and test each of these interventions in the field,” said Ko, “it would take years, if not decades, and it probably would never be done because of the cost. We’re showing public health officials in Brazil these data so they can make decisions about which interventions would give the best bang for the buck.”

Ko describes Yale as a bright spot in the young, expanding discipline of disease modeling. Galvani has brought Yale a high profile because of her innovative work and growing renown in the field. Adding to the luster, said Ko, are strong faculty recruits such as Pitzer, and Yale’s disease modelers are working with other Yale researchers from biophysics, health care economics and policy and sociology to refine their predictions.

“With the coalescing of all this talent and with all the synergies here,” said Ko, “Yale is certainly an emerging leader in the field.” [YPH](#)

Steve Kemper is a freelance writer in Connecticut.



An equation for the basic reproductive number (R_0) of typhoid, based on the model developed by Virginia Pitzer and colleagues. The basic reproductive number represents the expected number of secondary infections produced by one infectious individual in a fully susceptible population. It is an important measure in infectious disease modeling, allowing modelers to determine whether or not a pathogen is capable of spreading in the population.


The Pau da Lima *favela* in Salvador, Brazil, is where Professor Albert Ko does much of his research on leptospirosis and other infectious diseases. Leptospirosis primarily afflicts the urban poor, and rats are one of the major reservoirs of disease. Ko and his colleagues are using disease modeling in combination with traditional field studies to better understand the dynamics of leptospirosis infection.



Calculating

E100

YSPH researchers lead international effort to create a first-of-its-kind disease model to slow a deadly epidemic.



“We had to work very quickly, and there was a high level of intensity.”

—Jeffrey Townsend



1a

By Steve Kemper

Academic researchers rarely plunge into urgent medical emergencies. Yet that’s what happened at the Yale School of Public Health in response to the 2014 Ebola epidemic in West Africa, the worst such outbreak in history.

The first cases of the deadly disease were reported in March 2014. Several thousand people were dead and thousands more were ill by July. The rates of infection and mortality in the main locations – Guinea, Sierra Leone and Liberia – were climbing so fast that the region’s medical personnel and facilities were overwhelmed. By early August the World Health Organization declared the epidemic an international public health emergency.

At almost the same time, a team of YSPH researchers and their international colleagues was quickly taking shape. They began building a mathematical “disease model” for

Ebola in Liberia, which at the time had the most cases. The goal was to detect patterns of infection, which could provide clues about how to thwart transmission, and to anticipate the epidemic’s next phase, which could help beleaguered health officials decide where to focus scarce resources.

Building a model

The challenge was to build a model that could accurately describe such a dynamic epidemiological situation. “We had to work very quickly, and there was a high level of intensity,” said the team’s leader, Jeffrey Townsend, Sc.D., Ph.D., associate professor of biostatistics and of ecology and evolutionary biology and director of bioinformatics at the Yale Center for Analytical Sciences. “We also called in collaborators from other places to get tasks done on a useful time scale. As soon as something came on your desk, you had to move on it. Things aren’t usually done this way in academic research.”

The team eventually included eight scientists from Yale and others from the Santa Fe Institute, the University of Texas, the University of São Paulo (Brazil) and Liberia’s Ministry of Health and Social Welfare. None of them had ever built a model for Ebola.

Disease modeling depends on accurate data, but in mid-August accurate data on the epidemic were scarce or incomplete. The Yale team began working with what it had: viral sequencing data released in mid-August on 78 patients in Sierra Leone and literature about previous smaller outbreaks. They found hints in both sources that encouraged them to combine the sequencing data with an atypical mathematical model that took into account “clusters” of infectious transmission – that is, transmission concentrated within social networks. The typical model for epidemics, by contrast, assumed random transmission, as with influenza. The researchers ran thousands of computer simulations, constantly tweaking their hybrid model.

Meanwhile they also offered their help to Liberia’s Ministry of Health and asked for any available information. Data began arriving from the country’s “contact tracers,” who interviewed infected patients and then worked backward to find everyone who had been in contact with them. These people likewise were traced, in a widening ring. All of them were tested for Ebola, and anyone infected was isolated from the general population as a means of containing the epidemic.

At Yale, one of the model builders was Dan Yamin, M.Sc., Ph.D., associate research scientist in epidemiology, who came to Yale from Israel as a postdoc to work on disease modeling. Among the challenges, he said,

were “the messy data” coming from the urgent effort in Liberia and incorporation of the x factor of human behavior, “because it plays a huge role in disease transmission.” For instance, the model has to reflect the extent to which Liberians did or did not cooperate with the contact tracers.

Important findings

By early September, after working nearly around the clock for several weeks, the Yale team felt confident in their model and informed Liberian officials of the results. There were two important findings: first, Ebola was being transmitted primarily within dense social clusters – households, funerals and health care facilities. And second, estimates about the number of unreported cases had been wildly inflated by other modelers. “Ebola is so scary that fear tends to drive overestimates even from experts,” Townsend said.

The Centers for Disease Control and Prevention, for instance, predicted that for every reported case, 2.5 others were going unreported. This led the CDC to estimate that by January 2015 there could be 1.4 million cases of Ebola in West Africa, a horrific possibility. But the Yale team’s model suggested that since most transmissions took place within small social networks, and since the Ebola virus

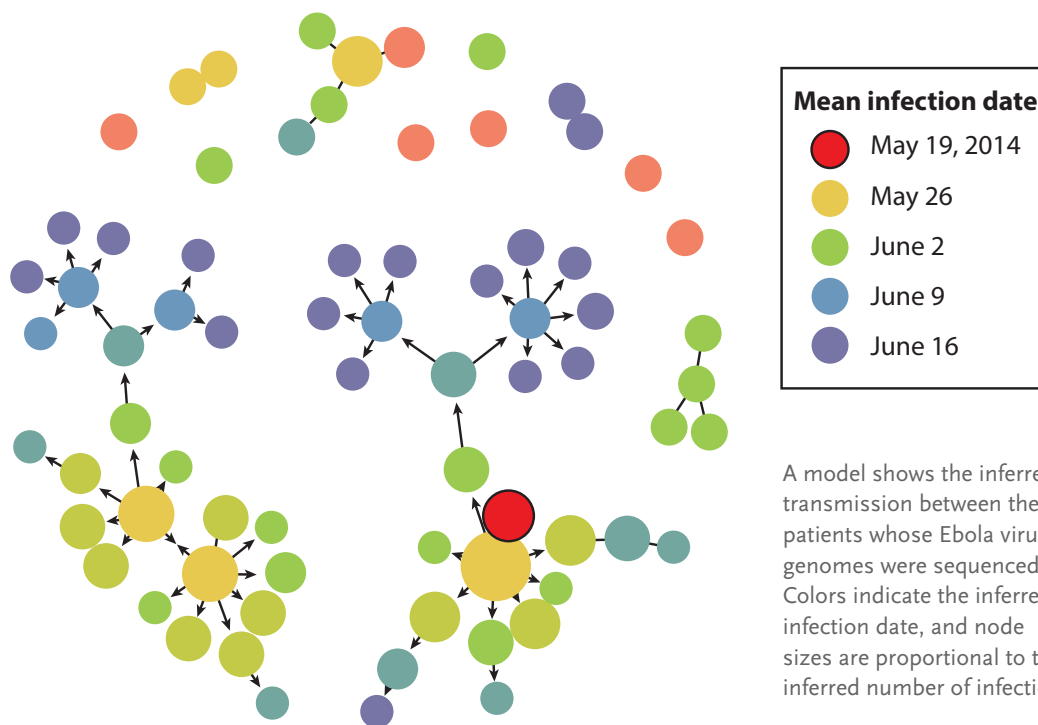
genomes sequenced from infected subjects tended not to have evolved much from one known infected individual to the next, only 1.2 cases were going unreported for every reported case. In fact by January 2015 there were fewer than 20,000 cases.

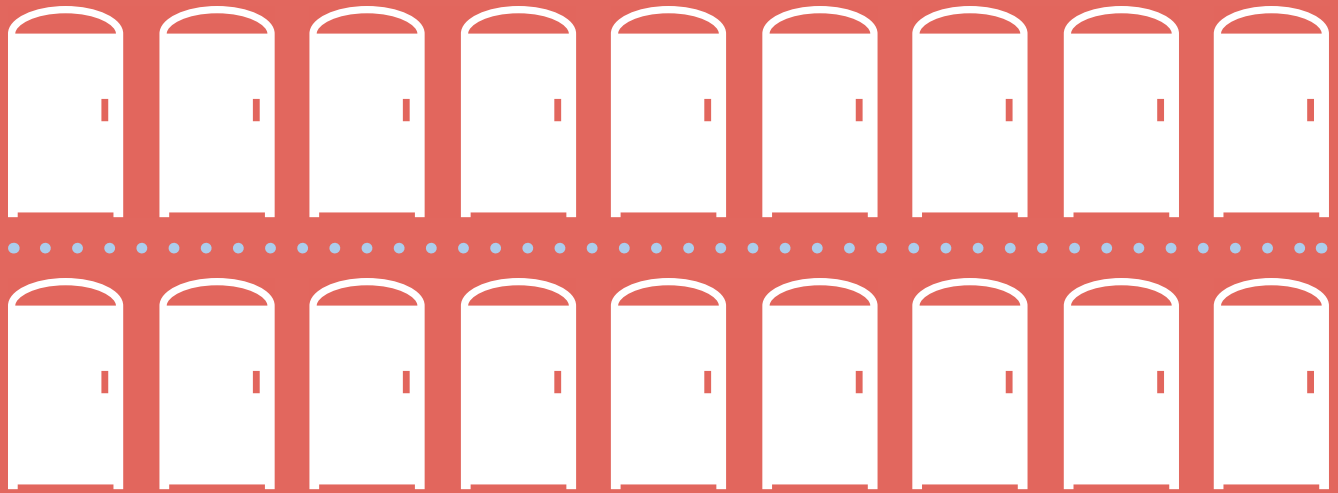
The Yale researchers also found that the people most likely to transmit the disease had been infected for more than four days. This suggested that if health care workers focused on new cases and isolated them within four days, the epidemic could be stemmed. This, too, was validated by the team’s chief collaborator in Liberia, an epidemiologist named Mosoka Fallah, M.A., Ph.D., M.P.H., whose system of quickly locating and isolating infected patients eventually stopped the epidemic in Liberia.

To help fight the epidemic, the Yale team shared its findings and data immediately, even before publishing them. The model might also be useful in responding to future outbreaks.

Neither Townsend nor Yamin had ever worked on something so urgent. “It was satisfying and wearying,” said Townsend. “There was a motivation to get a result beyond the academic.” Added Yamin, “When we heard about the tough conditions there, we wanted to help, and we felt honored to contribute.” YPH

Steve Kemper is a freelance writer in Connecticut.

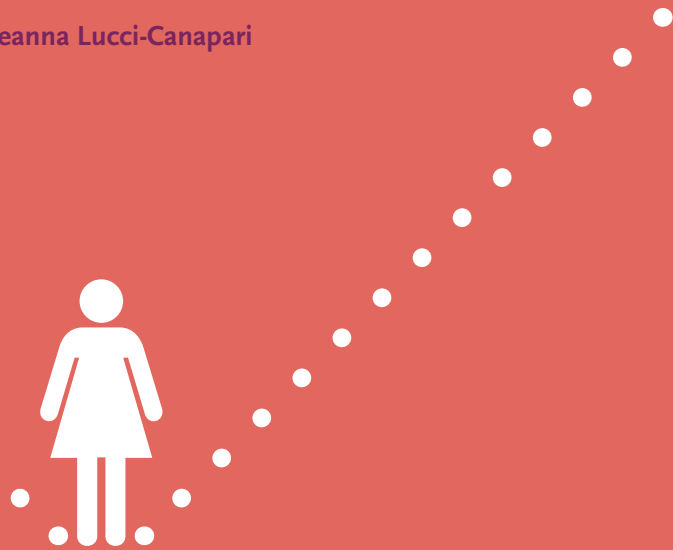




Detering Assaults

Researchers construct mathematical models to find policy solutions to an epidemic of sexual violence.

By Jeanna Lucci-Canapari



In the informal townships of South Africa, walking to public toilets, particularly late at night, comes with a daunting challenge for women: increased risk of sexual assault.

The problem is complex and urgent, and it defies easy solutions.

In a paper published in *PLOS ONE* in 2015, a group of Yale researchers turned to mathematical modeling to address a public health crisis.

The researchers demonstrated with math that an increase in public toilets in Cape Town's Khayelitsha township would likely result in a decrease in sexual violence against women.

While working in Cape Town, Gregg S. Gonsalves, a prominent AIDS activist and a Ph.D. student at the School of Public Health, became aware of the growing risks of sanitation-related sexual violence. He discovered that there



has been little quantitative research on a subject that has so severely impacted women’s health and human rights in the townships.

Coursework at Yale introduced Gonsalves to the field of operations research, which employs mathematical models to solve real-world problems pertaining to behaviors, such as queuing, congestion or supply-chain issues. Gonsalves saw that these methods might be applied in a novel way to the question of toilet access in the townships. “My eyes were open to the power of mathematical models to answer key questions in public life,” he said.

Gonsalves sought the expertise of operations research field leaders Edward H. Kaplan, Ph.D., the William N. and Marie A. Beach Professor of Operations Research at the School of Management, professor of public health and professor of engineering, and A. David Paltiel, Ph.D. ’92, professor of public health, to devise a mathematical model that would help fill in the gaps of knowledge caused by a lack of real-world data.

In contexts where the cost of field research is a roadblock, or data are incomplete, “a modeling-based approach may inform the response to questions that simply can’t be held hostage indefinitely to the absence of perfect scientific data,” said Paltiel.

Compiling available data—including census information, historical data about sexual violence rates and the supply and location of toilets—the team created a series of parameters that estimated variations of key factors such as the number of times per day a woman would use the toilet

“My eyes were open to the power of mathematical models to answer key questions in public life.”

—Gregg Gonsalves

and how far, and how fast, she would need to walk to reach one. They then calibrated the model to match known statistics on rates of sanitation-related sexual assault.

In 87 percent of the approximately 10,000 possible scenarios played out by the model, the answer was the same: installing additional toilets would reduce the opportunity for sexual violence and, in turn, save money in the long run. That finding, said Kaplan, “makes it possible to give a very robust policy recommendation.”

Cost then becomes essential. Gonsalves turned to the model to determine how many toilets would have the



Our model of assault risk

<i>Total Assaults</i> $A(n)$	=	<i>Exposure Time</i> $h(n)$	*	<i>Assault Rate</i> r
---------------------------------	---	--------------------------------	---	----------------------------

So, we finally arrive at...

$$\frac{\text{Total Assaults}}{A(n)} = \frac{k}{\sqrt{n}}$$

$$k = 2r \times \frac{\text{annual toilet visits/woman}}{\text{walking speed}} \times \frac{1}{4} \sqrt{2\pi g} \times \sqrt{\sum_{j=1}^m \text{pop}_j} \times \sum_{i=1}^m \# \text{ women}_i \times \sqrt{\frac{a_i}{\text{pop}_i}}$$


greatest impact at the lowest cost to the public. With no data available on the cost of sexual violence in South Africa, Gonsalves adjusted U.S. figures to the gross domestic product of South Africa to find an approximation. As a result, the team determined that the optimal number of public toilets in Khayelitsha, which has a total population of approximately 400,000, would be 11,300, roughly double the number of toilets currently in place.

“You are better off investing in toilets than you are living with the cost of sexual violence in Cape Town,” said Gonsalves. “And so the case is, pay now or pay later.”

Aside from providing a potential solution, the study opens up a dialogue for future researchers on a range of topics, including the nature of sexual violence, such as whether rape is an opportunistic crime, and if the additional public toilets might shift assaults to other locations. Gonsalves hopes that other researchers will continue to delve into what has been a neglected issue until now. “If people see our study as ‘just a model,’” Gonsalves says, “hopefully they will do field research to prove us wrong or prove us right.” YPH

Jeanna Lucci-Canapari is a freelance writer in Connecticut.



Reprinted with permission from the Water Supply and Sanitation Collaborative Council

A poster warns of the dangers associated with using public bathrooms.

Costing Analysis

Let $T(n)$ be the total social cost of sexual assault and toilet provision when supplying n toilets,

$$T(n) = cn + sA(n) = cn + \frac{sk}{\sqrt{n}}$$

where

- c = cost of providing and maintaining a toilet
- s = social cost per sexual assault
- n = total toilets available
- $A(n)$ = total assaults with n toilets available.

Optimal number of toilets

$$T(n) = cn + sA(n) = cn + \frac{sk}{\sqrt{n}}$$

Hence, the cost-minimizing number of toilets, n^* , is given by:

$$n^* = \left(\frac{sk}{2c}\right)^{2/3}$$

Courtesy of Gregg Gonsalves (4)

Q&A

A conversation with Reza Yaesoubi



Reza Yaesoubi

Reza Yaesoubi joined the Yale School of Public Health faculty last July, further building on the school's growing specialty in mathematical modeling as a public health tool. Yaesoubi, Ph.D., assistant professor in the Department of Health Policy and Management, uses mathematical and computer simulation models, statistical methods and optimization techniques to conduct cost-effectiveness analyses of colorectal cancer screening strategies; estimate the societal willingness to pay for health; and characterize performance-based payment systems for preventive care systems. He also works on controlling the spread of infectious diseases, including tuberculosis, influenza and meningitis.

What is disease modeling and how important is this approach as a public health tool?

RY: Modeling is the development of a mathematical or computer prototype of a physical system such as a hospital serving patients, an infectious disease spreading in a population or a cancer spreading in a patient's body. One of the main goals in modeling is to generate evidence about how the system would behave in different scenarios without implementing them in real life. And that's what makes modeling an important public health tool; it enables us to investigate the impact of various health alternatives and to make informed choices about how to allocate our resources to gain the best health outcomes.

What are the particular strengths of modeling?

RY: Imagine that we are responding to a novel pathogen outbreak (such as SARS or H1N1). We might consider isolating suspect cases; closing schools, workplaces or borders; or encouraging the population to stay home and avoid crowded areas. There are numerous ways to implement these control measures, each of which can yield different cost and health outcomes. We cannot test each alternative in real life because of time and resource constraints, as well as ethical concerns. But we can use models to compare all these alternatives based on their ability to mitigate the outbreak and on their resource requirement. Such analyses can be used to inform the best response strategies.

Are models currently being used in ways that they haven't been in the past? What is an example?

RY: Analyzing models often involves intensive computations, and therefore the ways we employ models are changing with technological advancements in computation. For example, there is a class of simulation models called agent-based models that emerged with the advent of faster processors. These models are widely used in analyzing infectious-disease epidemics because they allow us to model the behavior and the evolution of each population member during an epidemic. These models also enable us to study more realistic interventions (for example, to investigate the contacts of diagnosed cases), which were not possible with classical mathematical models.

Can you describe your work with disease modeling?

RY: I develop simulation models to study the impact of different health policies and guidelines on population health and consumption of resources. I am currently focused on models to answer policy questions in controlling tuberculosis, influenza and meningitis epidemics. I have also been involved in modeling colorectal cancer screening tests, as well as health care markets.

What do you see as the limits of disease modeling?

RY: In my opinion, there are two major challenges in modeling studies. First, developing valid and useful disease models often requires a multidisciplinary team of scholars with a background not only in medicine and public health but also in decision science, statistics and computer science. Assembling such a team or acquiring these skill sets can be challenging. The second limitation is that developing models can be a time-consuming process. Sometimes it may take years to reach a stage where the model can be used to study a question.

What are your long-term research goals?

RY: I would like to see modeling become a standard approach in studying policy questions in medicine and public health. Modeling can be a powerful tool for this purpose, but I don't think its strength is currently fully utilized.

“One of the main goals in modeling is to generate evidence about how the system would behave under different scenarios without implementing them in real life.” —Reza Yaesoubi

How important will this tool be for the future of public health research?

RY: One application of modeling is to inform cost-effective decisions. I believe modeling will play a more important role in the future, as we begin to recognize its strength in identifying the most efficient and cost-effective strategies to allocate our limited health care resources to maintain population health.

How did you prepare for this kind of work?

RY: My training is in industrial and systems engineering. This field emerged during the Industrial Revolution era with the goal of improving the efficiency and quality of production systems. But modelers come from various disciplines, including but not limited to mathematics, operations research, epidemiology, statistics, computational biology and computer science.

“Modeling can be a powerful tool for this purpose, but I don’t think its strength is currently fully utilized.”

—Reza Yaesoubi

How widely is modeling being used by researchers? Aside from public health, where else is mathematical modeling being used?

RY: Modeling is used in various disciplines with different goals. In economics, physics or chemistry, a main application of modeling is to understand economic, physical or chemical processes and phenomena. In meteorology, prediction is the main application. And in public health, informing decisions to improve population health might be the main goal.


When did you come to Yale? Were you drawn to the university (at least in part) because of its strengths in this field?

RY: I joined the Department of Epidemiology of Microbial Diseases as a postdoc in September 2014 and started as an assistant professor in the Department of Health Policy and Management in July 2015. One major element that drew me to Yale was the commitment of the school to modeling efforts. There are many faculty members across the university with different backgrounds who are actively engaged in modeling studies and research; there are now a number of modeling courses that are being offered at YSPH, and there are efforts to add a new “public health modeling” concentration for M.P.H. students. (*Editor’s note:* A modeling concentration was launched at the Yale School of Public Health in April. See story on page 24.)

You are teaching a course titled “Advanced Topics in Modeling Health Care Decisions.” Can you describe it?

RY: M.P.H. and Ph.D. curriculums in public health usually offer some courses on the fundamentals of medical decision making and resource allocations in which students can learn how to interpret and use the results of modeling studies to inform health care decisions. In the course I am teaching, we delve into the methodologies for developing and analyzing health care simulation models using Excel spreadsheets. Students also gain hands-on experience in various aspects of model development and analysis through a final course project. **YPH**

Michael Greenwood



Modeling concentration launched at YSPH

New program will provide students with public health modeling skills.

By Jeanna Lucci-Canapari

A new concentration in public health modeling that draws upon a range of faculty expertise has been created at the Yale School of Public Health.

“It happens that the modeling group here is arguably the best in the world now,” said A. David Paltiel, Ph.D. ’92, professor and director of the concentration. He noted that because of the relative youth of the participating faculty, “Yale could be the pre-eminent place for this sort of important public health policy research for the next 30 years.”

Along with Paltiel, nine other modeling experts from across the school are involved in the interdisciplinary concentration. They include Theodore Cohen, M.D., M.P.H., D.Ph., associate professor; Forrest W. Crawford, Ph.D., assistant professor; Edward H. Kaplan, Ph.D., the William N. and Marie A. Beach Professor of Operations Research and professor of public health; Edieal J. Pinker, Ph.D., professor of operations research and of health policy; Virginia E. Pitzer, Sc.D., assistant professor; Jeffrey Townsend, Ph.D., associate professor; Joshua L. Warren, Ph.D., assistant professor; Daniel M. Weinberger, Ph.D., assistant professor; and Reza Yaesoubi, Ph.D., assistant professor.

Public health modeling uses mathematical equations and computer simulations to connect data from a set of interrelated systems and processes, including biological, behavioral and social processes, to account for observed patterns in real-world behavior. Modelers seek to determine how these patterns arise and may change over time, which can then help researchers design effective interventions for a variety of public health problems.

In addition to the concentration, the school has the Center for Infectious Disease Modeling and Analysis (CIDMA), directed by Alison P. Galvani, Ph.D., the Burnett and

Stender Families Professor of Epidemiology. CIDMA uses mathematical modeling to address a range of infectious diseases, including HIV, tuberculosis, influenza, rabies and dengue fever.

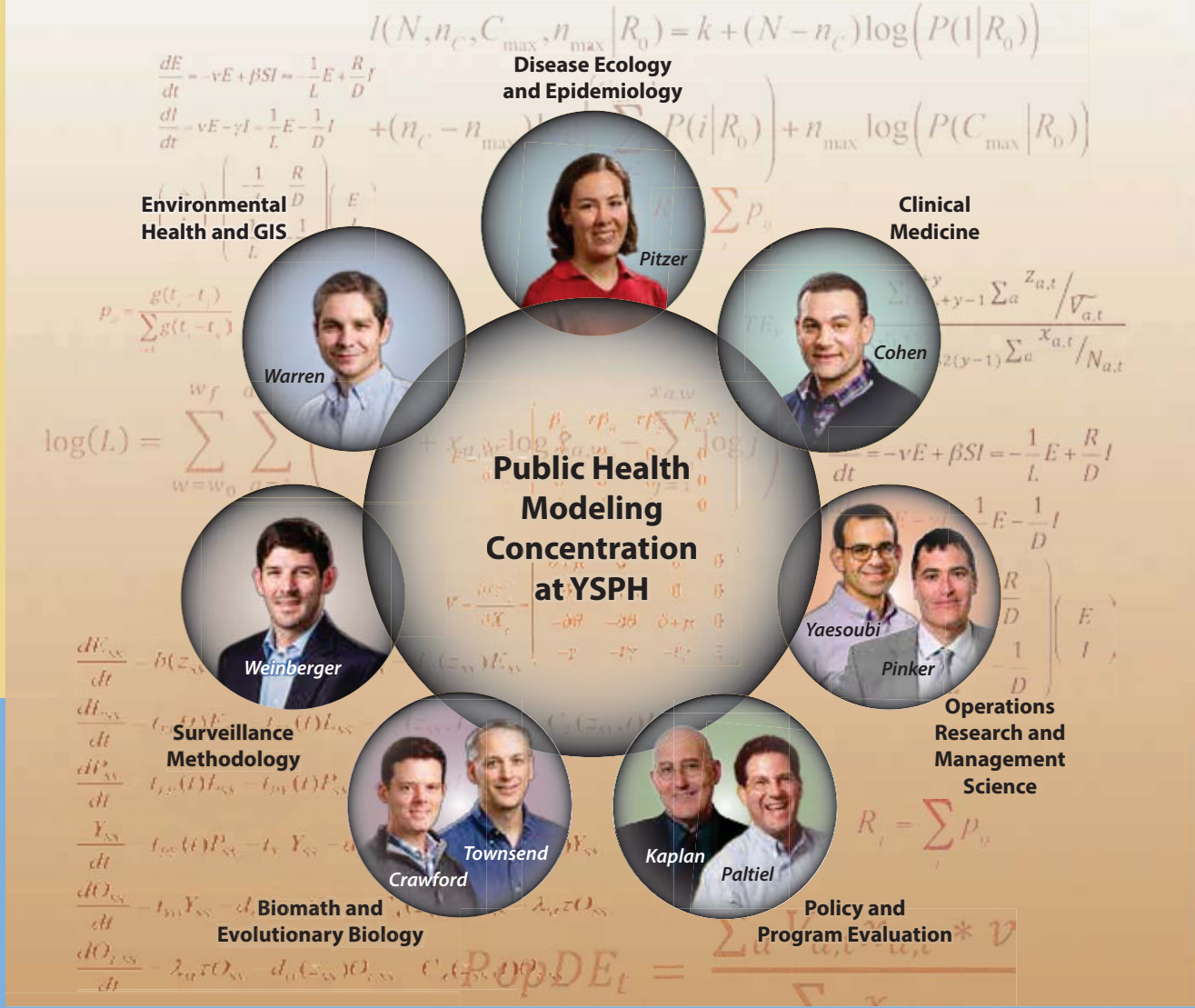
Modeling is taking its place among other well-established methods for public health research and can be seen as a “third pillar” alongside analysis of observational data and experimentation, Paltiel said. It comes to the forefront when more traditional methods reach the limits of their usefulness, such as when trials are too expensive or will take too long or when there are ethical concerns about conducting a particular line of research.

Modeling is an increasingly important skill for many people who plan to pursue public health careers, and the concentration will be a valuable resource for them, said Dean Paul D. Cleary.

“We are incredibly excited about this cutting-edge program and the skills and insights that it will impart to our students,” he said. “YSPH is fortunate in having numerous faculty in multiple departments who are experts in developing and evaluating such models.”

The concentration will burnish Yale’s reputation as one of the leading centers for disease modeling, alongside other excellent programs such as those at Imperial College London and the University of Washington. What sets the Yale modeling group apart from the competition is the breadth of disciplines it encompasses and the interdepartmental and collaborative spirit of its faculty, Paltiel said.

The affiliated faculty’s expertise spans a range of disciplines that all contribute to understanding the complex mechanisms and systems that drive the health of populations. Pitzer’s background is in disease ecology and epidemiology; Cohen is trained in clinical medicine; Warren’s interest is environmental health and geographic information systems;



Wendolyn Hill

and Weinberger examines surveillance methodology. Because there is much common ground between modeling and operations research, which originated in the field of business administration, several of the faculty come from that world: Yaesoubi and Pinker do operations research and management science, while Paltiel and Kaplan conduct policy and program evaluation.

Along with Townsend, Crawford will contribute his knowledge of biomathematics and evolutionary biology. Crawford noted that biostatistics is essential to modeling, providing the analytical and computational tools to fit models to data and to quantify the uncertainty in estimated model parameters and predictions.

“With the increasing availability of high-performance computing facilities, modelers and statisticians have been able to construct more realistic models of natural phenomena – such as disease dynamics – and to fit these models to real-world data,” Crawford said. “The modeling concentration will provide M.P.H. students with the skills and experience necessary to contribute to this important and rapidly growing field.”

To complete the concentration, students will take four courses in modeling, complete a summer internship and attend seminars in public health modeling. The first cohort of students will officially enroll in the 2016–2017 academic year. Much of the impetus for the new concentration comes from the students themselves, many of whom have expressed increasing interest in incorporating modeling into their methods of research, said Melinda M. Pettigrew, Ph.D. '99, associate professor and associate dean for academic affairs. Pettigrew hopes that the new concentration will further the school's three-part mission of teaching, research and service and will strengthen the school's reputation, both in the university as a whole and nationally.

Paltiel said that it is the spirit of collaboration at Yale that makes an interdisciplinary enterprise like the modeling concentration possible. At Yale, he said, “the walls are surprisingly porous. ... What makes it so unique here is the fact that it is so easy for us to reach across departmental lines and school boundaries. That's a tribute to Yale.” YPH

Jeanna Lucci-Canapari is a freelance writer in Connecticut.



Dean Paul Cleary

Pivotal leader stepping down after 10 years

By Michael Greenwood and Jennifer Kaylin

It is hard to believe now, but in the late 1980s the future of the Department of Epidemiology and Public Health at Yale, as it was known then, was in jeopardy.

There were discussions about closing the program and moving faculty into other departments at the medical school. Under Deans Jan A.J. Stolwijk, Ph.D., and Michael H. Merson, M.D., the school was able to recruit outstanding faculty, rebuild the student body and initiate some important programs.

However, it is during the deanship of Paul D. Cleary, Ph.D., that the Yale School of Public Health has grown into the truly outstanding program that it is today, said Michael B. Bracken, M.P.H. '70, Ph.D. '74, a veteran member of the faculty and the Susan Dwight Bliss Professor of Epidemiology.

"Within Yale, Paul was able to bring the school to full independence while preserving important links with the medical school. The YSPH profile within the university, nationally and internationally, has never been higher. The quality of its faculty and students is equal to that of the very best programs anywhere in the world. Paul has led the renaissance in public health at Yale with humor, humility and a keen insight into where to invest resources, all while building a strong esprit de corps," said Bracken, who has been affiliated with the school since the late 1960s, first as a student and later as a professor.

Cleary was the perfect dean arriving at just the right time, Bracken said. His successor will have a strong foundation for taking the school to new heights.

After a decade at the school's helm, Cleary announced that he is stepping down to devote more attention to his lifelong research interests. Cleary will remain at the school as the Anna M.R. Lauder Professor of Public Health and as director of the Center for Interdisciplinary Research on AIDS. He will stay on as dean until a successor is appointed.

Cleary leaves a school that has grown considerably during his tenure, both financially and in terms of its research portfolio. Yale public health researchers are, for example, actively engaged in the school's home city of New Haven (fighting obesity); in Connecticut (addressing opioid overdoses); in the United States (examining the dangers associated with fracking) and in communities around the world struggling with health issues as diverse and urgent as Ebola, Zika and HIV/AIDS.

The school has a range of new research groups, including centers for disease modeling, climate change and the analytical sciences, as well as an array of new educational offerings to train future generations of public health professionals. Cleary has forged research partnerships in countries



Michael Greenwood



Bradley Clift



Harold Shapiro (c)

across the world – Brazil, China, Cyprus and Russia among them – to work on health problems of mutual concern.

Cleary took the school through its centennial celebration, and his impact is seen even in the way the school is classified at Yale and presented to the outside world. When Cleary took over the deanship in 2006, the school was a department within the Yale School of Medicine and was, in many respects, overshadowed by its established and successful partner. Today, it is known as the Yale School of Public Health, and while it retains its traditional ties to the medical school, it is now its own entity.

“Paul has done great things for our school,” said Brian P. Leaderer, M.P.H. ’71, Ph.D. ’75, the school’s deputy dean and a close associate. “His accomplishments are everywhere and his leadership has touched everyone associated with the school. He will be missed.”

In addition to overseeing the school through the process of reaccreditation, Cleary has been instrumental in improving many of the basic benchmarks of success in the past 10 years:

- A 50 percent increase in enrollment in the Ph.D. program since 2007
- An endowment hike of 34 percent (there have been 56 new funds created during Cleary’s tenure, compared with 26 during the first 90 years of the school’s history)
- A 60 percent growth in the financial aid budget
- A hike of 35 percent in the dollar amount of grant awards
- A 20 percent jump in the size of the ladder faculty

This progress was made possible, Leaderer said, because Cleary “created a management structure that provided a road to ensuring excellence. He also created an opportunity for departments and faculty, as well as students and support staff, to have a sense of ownership.”

Cleary got to know the people he worked with. He held a series of town meetings at which students and staff could ask questions. He also launched a mentoring program in which senior faculty are paired with junior faculty, and he made sure that the process of appointments and promotions was transparent. “That kind of thing is fundamental to Paul,” Leaderer said. “He just has that kind of sensitivity and concern.”

Yale School of Medicine Dean Robert J. Alpern, M.D., called Cleary “an extraordinary leader” who is “receptive to

the thoughts of others and creates a sense of inclusiveness.” One of Cleary’s major contributions to YSPH, according to Alpern, is in the area of faculty recruitment. “Paul has done a great deal to grow the research and educational programs in both size and quality,” Alpern said. “He has nicely set the stage for transition to the next dean.”

As a medical sociologist, Cleary has focused his research on individuals infected with HIV as well as the assessment and improvement of care quality. He earned his B.S., M.S. and Ph.D. degrees from the University of Wisconsin. He taught there and at Rutgers University before joining the faculty at Harvard Medical School, where he was a professor of medical sociology in the departments of Health Care Policy and Social Medicine. At Yale, Cleary is also affiliated

“Our recent achievements would not have been possible without the help and support of the YSPH community, and for those I am deeply grateful.”

—Dean Paul Cleary

with the Department of Sociology and the Institution for Social and Policy Studies.

Two aspects of educating future public health practitioners that Cleary feels strongly about are collaboration and global health. He has established several collaborative research projects and joint-degree programs, including a biostatistics center with Shanghai Jiao Tong University in China.

In announcing Cleary’s decision to leave his post, Yale President Peter Salovey, Ph.D. ’86, praised him for his “outstanding tenure” as dean, noting that under his leadership Yale was named one of *U.S. News and World Report’s* Best Global Universities for Social Sciences and Public Health in 2016.

True to form, when talking about his decision to step down, Cleary deflected attention from himself and thanked the YSPH community for its help in further improving public health at Yale. Instead of a goodbye party, he urged



“His accomplishments are everywhere and his leadership has touched everyone associated with the school. He will be missed.”

—Brian Leaderer



Michael Greenwood

Dean Paul Cleary takes the ALS Ice Bucket Challenge in 2014 on the lawn of LEPH to raise money for a disease that affects nerve cells in the brain and the spinal cord.

the YSPH community to participate in the Day of Service, a volunteer effort in May to improve health and well-being in greater New Haven.

“Our recent achievements would not have been possible without the help and support of the YSPH community, and for those I am deeply grateful,” Cleary said.

One of Cleary’s favorite photos of himself as dean shows him being doused with a wave of icy water in 2014 as part of the ALS Ice Bucket Challenge during a schoolwide picnic

in the courtyard of LEPH. He dedicated the challenge to Alan Rosenfield, a friend and colleague from Columbia University who died of ALS.

In the photo, his dress clothes are soaked, but he is obviously happy. Moments later, he thanked the many supporters who had gathered around him.

“That speaks to who he is,” Leaderer said. [YPH](#)

Student-Alumni Mentorship Program Flourishes

**Yale School of Public Health program
pairs aspiring health professionals with
specialists in the field.**

By Jennifer Kaylin

During the first year of his M.P.H. program, David Kates heard about the Yale School of Public Health Mentorship Program. Kates wanted to connect with someone experienced in operations at a large health system – and he realized that the program was a perfect way to do that.

He reviewed the backgrounds of several potential mentors using the program’s online matching system and ultimately chose Andrew Missel, M.P.H. ’11, a program manager at Population Health Care Management in Ann Arbor, Mich.

“I was unclear about what I wanted to do,” Kates said. “So I called him, and we talked about my interests and his.”

Missel turned out to be a great resource, even helping Kates prepare for job interviews and then debriefing him afterward. Missel gave Kates advice on a range of topics, including the kinds of interview questions he could expect. “It was just the right level of engagement for me,” Kates said. With Missel’s help, Kates got a summer internship at Kaiser Permanente, working as an operations consultant. “It was another resource for learning about life outside school,” Kates said. “I’m wiser for it.”

The mentorship program is a tool that helps alumni stay involved with their alma mater while helping to prepare current students for life after Yale. Drawing from a pool of over 4,500 alumni, this growing program connects students with alumni who have common interests and relevant professional experience to share.

Students choose mentors at the start of the academic year and connect with them as needed throughout the year. Mentors provide guidance on topics such as academic work, summer internships and professional aspirations. As students establish connections with their alumni mentors, they learn about the career paths alumni have taken, hone their leadership and management skills and learn about industry trends.

“The most important element of the program is that it connects our students, many of whom have limited professional experience, with alumni, who serve as guides, advisers and sounding boards,” said Martin Klein, M.P.H. ’86, Ph.D., associate dean for development and external affairs. “If the relationship flourishes, alumni may also help students broaden their network and connect with potential employers.”

Alumni can learn more about the program at publichealth.yale.edu/alumni/mentoring/index.aspx. Students are encouraged to review potential mentors’ backgrounds so that they can be paired with alumni who share their interests. The selection process begins in the fall, and students may choose two mentors. Likewise, mentors may advise two students. **YPH**

“I’m wiser for it.” –David Kates



Gabrielle Daniels
M.P.H. student

“My mentors both had a willingness to extend themselves to me and on my behalf. They are wonderful connectors, and I have truly appreciated their time and efforts.”



Denise Stevens
Alumni mentor, Ph.D. '95

“The most memorable moments of mentoring are when you are sharing your story with them, and they realize that it is okay to walk down one path that ends up being a dead end and to then turn around and follow another path – as long as you learn something at every turn.”

David Kates
M.P.H. student

“He was very excited to be a mentor and suggested that we start a reading club where we would share articles with each other and discuss their health implications. I found that to be incredibly helpful.”





Caroline Stampfel
Alumni mentor, M.P.H. '05

“I love the opportunity to engage with students who will be our next generation of young professionals. I really like being able to share the path I took in public health and giving the students ideas for what their paths could look like.”

Margaret Mayer
M.P.H. student

“My mentor’s interests and accomplishments lined up extremely well with my own, and her enthusiasm for helping a fellow YSPHer was key in my getting a summer internship.”



Eileen Huang
Alumni mentor, M.P.H. '13

“Being a mentor allowed me to reconnect with my experiences at YSPH. It is inspiring to hear from current students about their accomplishments, and knowing that they are the future of public health gives me a sense of responsibility and the honor of being their mentor.”



Students

Undaunted by Ebola



Mara Lavitt

A YSPH doctoral student travels to Liberia at the height of a deadly outbreak to aid the public health response.

By Jenny Blair

When history's worst-known Ebola epidemic began to sweep across West Africa in 2014, many people scrambled to leave. Laura Skrip, on the other hand, longed to be there.

That September, she got her wish. The Yale School of Public Health Ph.D. candidate boarded a plane with Ryan Boyko, a former Ph.D. student, for a three-week stint in Monrovia, Liberia, where the two of them helped design and pilot a mobile health app. Their work assisted Liberian efforts to contain the epidemic and ended up changing Skrip's plans for her own future. Though its conclusion was marred by a controversial quarantine for both students, Skrip's work continues to be built upon in Liberia—and she can't wait to go back.

"In the stressful situation of working on the time-sensitive Ebola crisis, Laura exhibited an extraordinary combination of passionate industriousness and calm level-headedness," said Alison P. Galvani, Ph.D., the Burnett and Stender Families Professor of Epidemiology, director of the School of Public Health's Center for Infectious Disease Modeling and Analysis and Skrip's adviser.

Laura Skrip traveled to Liberia during the height of the 2014 Ebola epidemic to assist the government's efforts to stop the disease. Despite the grueling pace of the work there and then returning home to a mandatory quarantine, Skrip said that she would do it again, "in a heartbeat."

Ebola emerges

Trained in biostatistics, Skrip, M.P.H. '13, works with Galvani to develop mathematical models of infectious diseases like hookworm and visceral leishmaniasis. The models seek to represent the way in which populations proceed through the disease state, from exposure to sickness to recovery or death, as well as how various interventions like vaccination or insect control influence those events.

Having fallen in love with global health on overseas trips as an undergraduate, Skrip watched with anguish when the Ebola epidemic raged through Liberia and neighboring countries. She longed to contribute but assumed that only doctors were needed on the ground.

"Watching things spread like wildfire and not being able to help out in any meaningful way," Skrip recalled, "made me feel really helpless."

But Galvani had Liberia-based projects under way, and the country's Ministry of Health and Social Welfare was already exchanging epidemiological data with the Yale center that Galvani directs. When officials asked Galvani

“Watching things spread like wildfire and not being able to help out in any meaningful way made me feel really helpless.” —*Laura Skrip*

for information technology and data collection support, she turned to her students. Skrip jumped at the chance.

She and Boyko flew to Monrovia and quickly got to work. They were asked to improve data collection methods and convert the ministry’s online summary reports of cases, deaths and hospitalizations to a more accessible format.

Based at a hotel in the capital teeming with aid workers and journalists, Skrip and Boyko went straight to the Ministry of Health and Social Welfare each morning. Every evening they returned to the hotel, continuing to work in its restaurant until it closed for the night.

The pace was grueling.

“The guys [at the restaurant] knew never to let my cup of coffee go empty,” Skrip recalled.

To inform the Web-based Android app, Skrip coordinated with a community-based initiative to determine the best format and question series, while Boyko worked on the technical side. They were aided by Skrip’s uncle, Thomas Snyder, an information technology professional with experience building a health app in Uganda, and Thomas Murray, Snyder’s mentor.

Medical students and community workers used the app as they combed Monrovia neighborhoods gathering data on how Ebola was affecting residents. The volunteers entered data into its simple, standardized form either directly on their cell phones or after collecting it on paper. The form was intended to improve the quality of real-time data sent back to the Ministry of Health and Social Welfare, enabling officials to send support to heavily affected areas. Part of the database was also posted online.

“People were able to be trained quickly to use it,” Skrip said. “It’s a really good way to get information to decision-makers.” She said the app is now being revised to keep track of Ebola orphans and those in need of psychosocial or financial support.

A calling

A native of Buffalo, N.Y., Skrip, 33, earned a mathematics degree from Western Connecticut State University in Danbury. There, she met anthropologist Jeannie Hatcherson, who invited Skrip to join a group of students going to Bangladesh. In Dhaka, she worked in the burn unit of a public hospital. Over subsequent health-related trips to Cambodia, Ghana, and Brazil, Skrip became so fascinated

with global health that she began to question whether she really wanted a math career. Figuring she could participate as a physician, she re-enrolled at Western as a premed, ultimately earning a second bachelor’s in psychology while working three jobs.

But Skrip discovered her true calling while interning with a cardiologist in China. One day, he asked for her help with the statistical model for a paper he was writing. Biostatistics, she suddenly realized, could unite her interests.

“There’s math and stats, there’s global health, there’s traveling – there are all of these things,” she recalled thinking. “This is it!” The realization led her to enroll at the School of Public Health.

When Skrip returned from Liberia on October 11, 2014, she was filled with energy and excited to get others involved. But when she and Boyko were subjected to quarantine, her plans had to wait. The effect was deflating.

“The environment here did not seem very welcoming,” she said. “I didn’t want to come back and have to keep my distance from the people that I felt could actually help as well.” Skrip avoided the media storm that settled on Boyko and waited out the quarantine.

But she recovered her enthusiasm. She and Boyko have since given presentations about Ebola transmission at Yale and other universities.

Serving in Liberia was profoundly meaningful for Skrip. “Every second mattered,” she said. When she graduates, she plans to return to West Africa to stay, collaborating with officials and health experts to improve the public health infrastructure there.

“I’m in awe [of what] Liberians have done to help other Liberians,” she said.

Galvani, for her part, admires Skrip. “Laura is an extremely modest, generous and talented individual who I am certain will have an important career in public health,” she said.

Does Skrip have any regrets? “I would do it again in a heartbeat,” she said. YPH

Jenny Blair, M.D. '04, is a freelance writer.

VETERANS DAY, EVERY DAY

Student seeks to improve the health of marginalized populations.

By Denise Meyer

Every day is Veterans Day for Rick Lawson.

Lawson, who graduated with his M.P.H. in May from the Yale School of Public Health, joined the military as a teenager and in 2002 was deployed to Balad, Iraq, for one of his four years of active service as a medical laboratory technician.

There was a time, early in his transition back to civilian life, when Lawson refused to answer questions such as “What was the war like?” or “Did you ever kill someone?”

Words, he said, cannot begin to describe the emotional impact of war, whether it was experienced on the front lines or from a logistical support position, such as his own, or even while serving in an administrative role.

Today, however, Lawson views the same questions differently. He sees them not as a chance to tell war stories but as a teaching opportunity, a way to connect with people and educate them about veterans and their lives after their service has ended.

While public opinion is more supportive of veterans of Iraq and Afghanistan than it was of soldiers returning from Vietnam, expressions of support often feel like lip service. “People often don’t know what to say, or what to do, to truly help those who served,” he said.

So Lawson has stepped into the divide. His goal is to create a forum for meaningful engagement between veterans and nonveterans and also to build support for those who, like himself, suffer from post-traumatic stress disorder (PTSD) and are struggling to resume their lives as civilians.

The War Experience Project

In 2008, as part of a class project at Western Washington University in Washington state, Lawson pulled out his old military uniform and started to use it as a canvas. Art allowed him to express some of his buried emotions.

That painting grew into The War Experience Project, a series of workshops organized by Lawson along with a

touring exhibit featuring veteran-painted uniforms neatly hung, formation-like, on display. Most of the veterans who contributed to the exhibit were not trained in art, but they experienced a similar catharsis.

Lawson also invited civilians to participate in separate workshops and to use art to address conflicted feelings from their own lives and explore their relationship to the military and its veterans. This mutual activity, he believes, creates a space that allows for meaningful dialogue—and healing—for veterans and civilians alike.

But such dialogues are not easy. Personally, Lawson said it continues to be a struggle to engage with the public and to be open about the sexual abuse he suffered in the military. He experienced depression after his discharge and struggles with PTSD. While the public needs to hear these stories, he said, each retelling reawakens the trauma.

Lawson has been quoted in *The New York Times* about his abuse, and he spoke at a 2013 White House meeting on sexual violence in the military. He has also been featured in several books about the Iraq War, including *Exit Wounds* by Jim Lommasson.

Despite this exposure, he remains circumspect about certain details of his traumatic experiences.

Ticket to a better life

Lawson enlisted in the National Guard shortly after finishing high school in 2002. On the heels of the 9/11 attacks, the Guard’s focus was on responding to domestic terrorism in the United States, Lawson said. He did not foresee being deployed overseas and, like many young enlistees, he saw military service as a ticket to education and a better life.

By age 22, Lawson had already been in the military for four years and lost a close friend to an IED. And even though he did go to college on the G.I. Bill, he found that he had trouble identifying with his fellow students. “Age does not equal maturity,” said Lawson, adding that his youthful face at times has been an obstacle to others taking him seriously. People too often dismissed him as a “kid” when he felt like a much older man, and his interests in



Courtesy of Rick Lawson (4)

college were very different from those of most undergraduates coming straight from high school.

Today, Lawson is particularly interested in emergency response and preparedness efforts. During his studies at Yale he interned at the Connecticut Department of Public Health and at Yale New Haven Hospital. These experiences dovetail with military training, said Lawson.

“Last spring, Rick worked on a range of projects with Jon Best, Connecticut’s director of Emergency Planning, Preparedness and Response,” said Shelley D. Geballe, J.D. ’76, M.P.H. ’95, an assistant clinical professor at YSPH who coordinated Lawson’s Health Policy Practicum placement. “His skill set was so strong, and his passion for the work so clear, he was quickly offered a job for the summer.”

While his studies at Yale were a priority, Lawson, a student in the Department of Health Policy and Management, and his wife, Valery Lawson, continued their work on behalf of veterans. When Valery moved to New Haven to join her husband, the couple decided to turn her cross-country move into a fundraiser to benefit veterans.

For this project, dubbed the Honor Expedition, the couple raised money and awareness for six veterans’ charities, including the Yale Veterans Association, during a meandering 4,000-mile cross-country car expedition in the summer of 2015. A documentary film of the tour by Raymond Montoya, a combat veteran and friend, is in the making.

Going forward, Lawson sees this work as applicable to the health of other marginalized populations.

It is “the lens from which I can move social issues forward,” he said. YPH

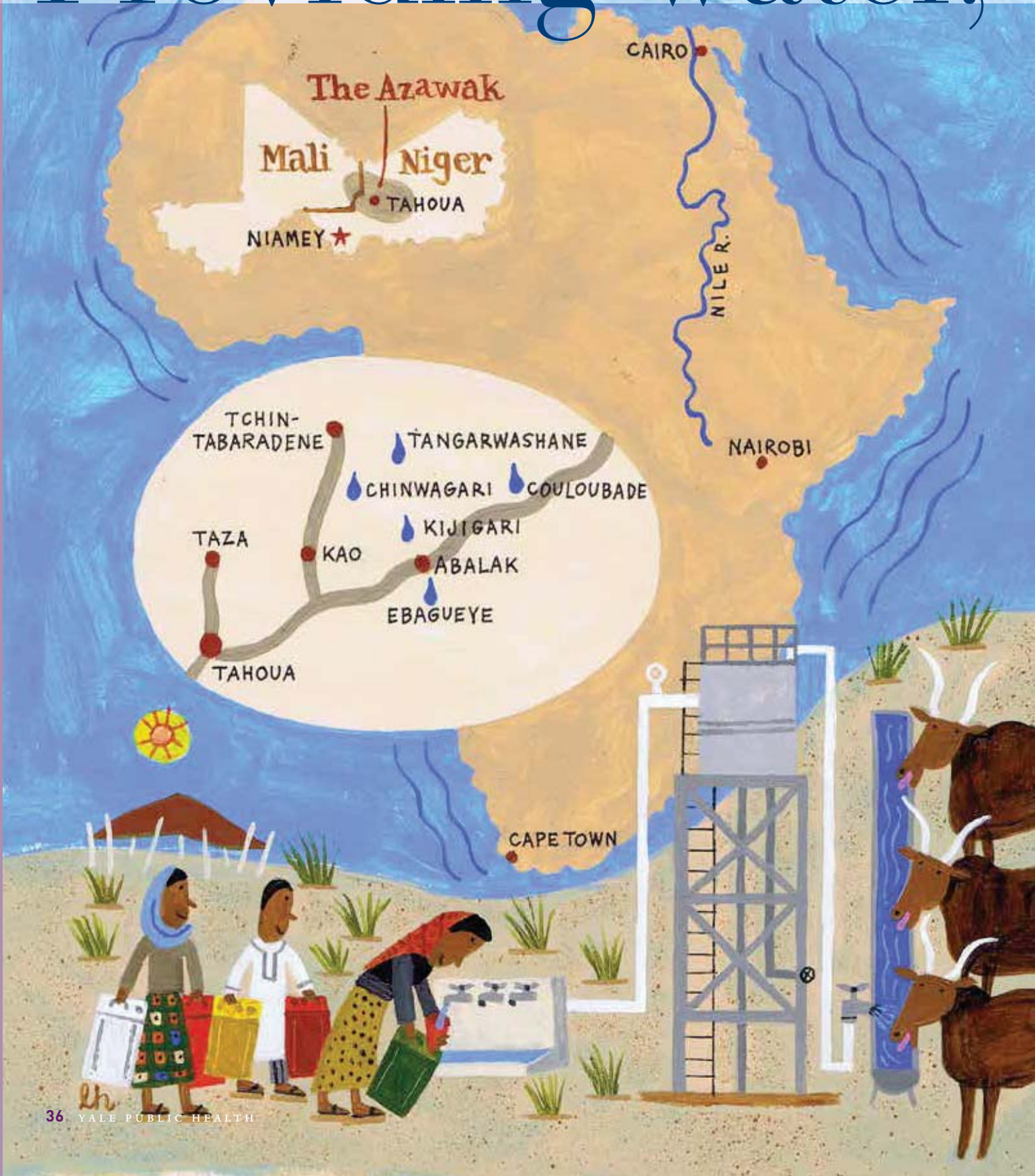
Top: The War Experience Project features military uniforms used as a canvas by veterans seeking to express emotions about their service and wartime experiences.

Middle: Rick Lawson and his wife, Valery Lawson, on a cross-country expedition last summer for the Honor Expedition. The program raises money and awareness for veteran-related charities.

Above: Rick Lawson, who graduated in May with an M.P.H. from Yale, wants to use his experiences in the military to address the mental health needs of marginalized populations. He created The War Experience Project and, with his wife, the Honor Expedition.

Learn more about The War Experience Project and the Honor Expedition online at www.warep.com and honorexpedition.com.

Providing water,



sustaining life

An alumna devotes public health skills to her beloved Africa.

By Jennifer Kaylin

Ariane A. Kirtley grew up in remote villages across West Africa, including in the Republic of Niger. The French-American daughter of *National Geographic* photojournalists, she bonded completely with the people in her villages.

“I didn’t have any friends who weren’t African, so to me, I was African,” she said. Her unusual childhood included a best friend, Julia, a gorilla that was being rehabilitated in Gambia to be returned to the wild. It was only when Kirtley grew older that she recognized the many needs and challenges her African “family” faced, and she decided, “I wanted to grow up and help the people who had helped raise me.”

That drive led Kirtley a continent away to Yale University, where she earned a bachelor’s degree in anthropology and, in 2004, an M.P.H. at the Yale School of Public Health. It was then that her plan to help her African friends started to take shape. As a Fulbright Scholar she visited the Azawak, a once-lush valley the size of Florida that straddles the border of Niger and Mali. Climate change has turned the region into one of the most drought-ravaged places on Earth.

The rainy season once lasted from July through September, but now it often lasts only a month, usually August. The pastures are green and the marshes are flooded. But then the marshes dry up and a desperate search for water begins. With temperatures routinely topping 100 degrees Fahrenheit, children can walk 30 miles or more looking for water in deep open wells. They wait for hours for their turn to get water, often only to find that the well has gone dry. Then they wait, sometimes for days, until the water is replenished. The lack of food and a prevalence of disease are epidemic. Half the children die before they reach the age of five.

Despite having spent years in rural Africa, nothing prepared Kirtley for the extreme deprivation and hardship she witnessed in the Azawak. “I thought I’d seen the poorest of the poor, but I hadn’t seen this,” Kirtley said. “In the space



Courtesy of Ariane Kirtley

Ariane Kirtley (right) and Denis Gontero (left), Amman Imman’s program director in Niger and Kirtley’s husband, stand with a village chief in front of the Kijigari borehole that was built in 2010. The region has a sustainable aquifer that is some 600 feet below the surface.

of 15 years, all their animals have died and they can’t grow anything.” When Kirtley tried to get large nongovernmental organizations involved, they said the area was too remote. Hearing this, Kirtley said, “I decided something had to be done.”

Amman Imman is born

That “something” was Amman Imman: Water is Life, an organization Kirtley founded just two years after earning her public health degree. Its mission is to provide water and other assistance to the people of the Azawak. As executive director and a member of the board, Kirtley recognizes that people’s primary needs must be met before other important but less pressing problems can be tackled. “If people are living better lives, they won’t poach or deforest the landscape,” she said.

Amman Imman's five boreholes in western Niger provide potable water for more than 100,000 people and animals.



Courtesy of Ariane Kirtley (2)

Kirtley spent months living with families in the Azawak, going from camp to camp to learn how best to help them. “I couldn’t abandon these people and tell them, ‘Nobody wants to help you. Your children are going to die of thirst.’”

A turning point came the day a woman overheard Kirtley, who was in tears as she described the suffering she was witnessing, on the telephone with her father. The woman donated \$120,000 to help Kirtley fund her fledgling Azawak relief effort. That led to more money from churches, schools and other donors and made possible the drilling of five 600-foot-deep borehole wells that have supplied water for more than 100,000 people and animals.

Working with a staff of four full-time employees, 20 volunteers and local consultants, Kirtley quickly saw that although water was an essential start, much more needed to be done.

“The people of the Azawak had no access to food, no skills, no economic opportunity, so we expanded our mission to include food security. Through an Amman Imman program called Oases of Life, food banks were created along with gardens with fruit-bearing trees. The program provides food security to more than 10,000 children and families. Additionally, an Amman Imman mobile health clinic provides malaria prevention programs and sanitation outreach services to more than 15,000 people.

Another important feature of Amman Imman, one that ensures that the organization will continue and thrive, is Wells of Love, a program that works with thousands of students from more than 100 schools worldwide. The goal is to instill a global consciousness and a humanitarian spirit in today’s youth.

Expanded reach

Professor Emeritus Curtis L. Patton, Ph.D., remembers Kirtley, his former student, fondly. He recalled how one day Kirtley showed up at his office in the Laboratory of Epidemiology and Public Health wearing roller blades. The skates facilitated travel around Yale’s expansive campus, but Patton felt he needed to warn her, gently, of the dangers posed by the city’s uneven sidewalks and busy streets.

Patton shares Kirtley’s passion for the necessity of clean water. “If we could deliver clean water, along with enough food calories to poor parts of the world, we would solve a lot of problems quickly. Babies would live,” he said. “A

planet of water and yet we’re going to destroy ourselves because we’re not taking care of it.”

Kirtley asserts that the Yale School of Public Health got her where she is today. Between her first and second years at the school, she did an internship in Niger. She then focused her attention on health program development. She credits Associate Professor Kaveh Khoshnood, M.P.H. ’89, Ph.D. ’95, among others, with “being extremely encouraging in so many ways.” And, she said, Professor Patton saw that “I had big dreams and he helped align things to make them happen.”

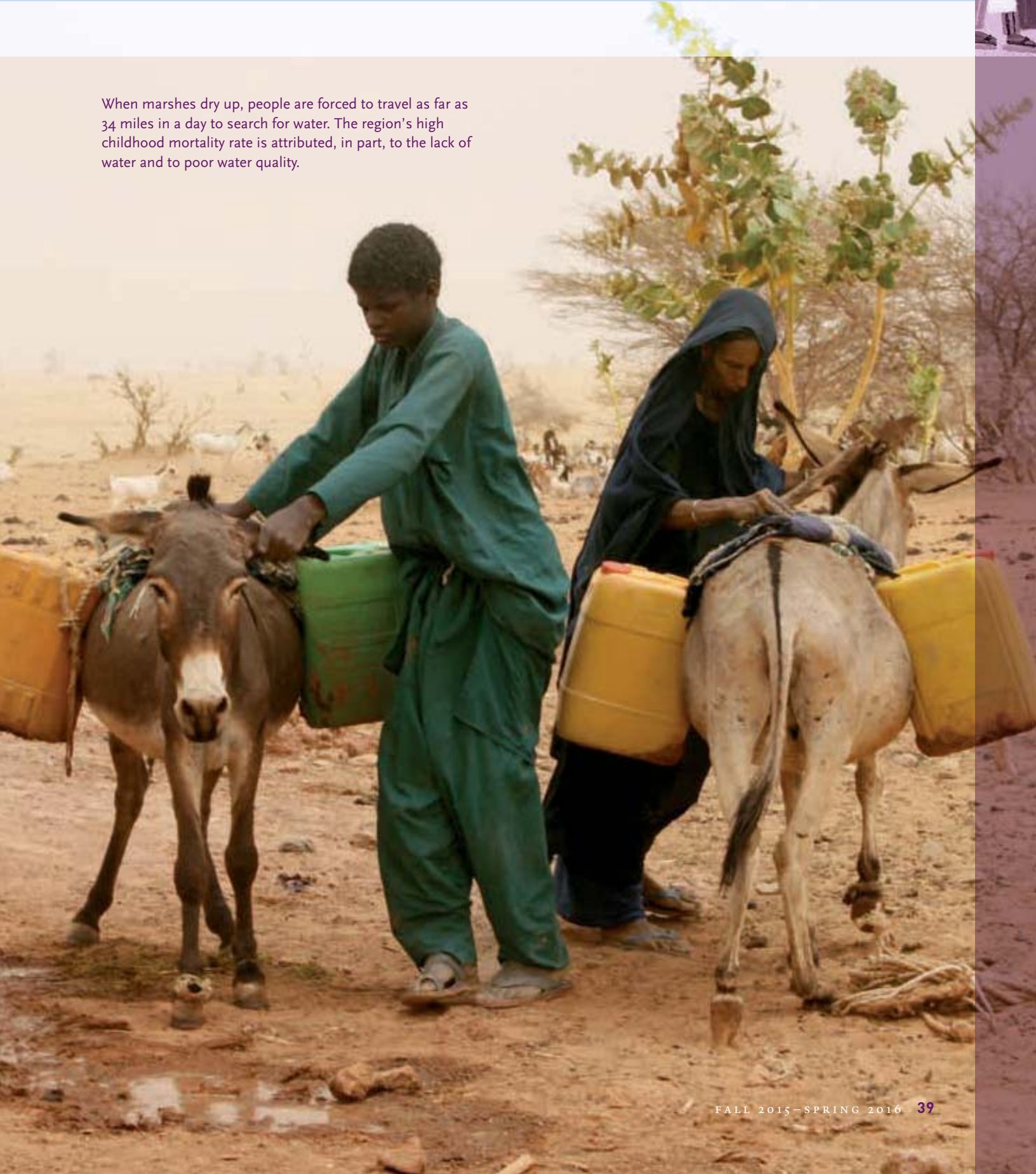
Besides being a creative problem solver, Kirtley is also a talented photographer who has taken many pictures of the people and places she has come to know in Africa. She also writes children’s books, most of which have been inspired by the African people who have left such an indelible mark on her. As the mother of two boys and a daughter, Kirtley wants to raise her children in the same it-takes-a-village style in which she grew up. “Everybody raised everybody else’s children. That’s how it was,” she said, “and that’s how I’ll raise my kids. They’ll be raised by me and my African friends.”

Kirtley knows her children will see “the extreme poverty but also the social beauty of Africa.” Basically, “their classroom will be the world,” she said. As for her African “family,” she doesn’t see the work she started as ever ending, although she’d like to step aside so she can concentrate on writing books.

Eventually, she’d like to see Amman Imman expand its reach. “Then we can start working on other areas of Africa where nobody else is doing anything.” [YPH](#)



When marshes dry up, people are forced to travel as far as 34 miles in a day to search for water. The region's high childhood mortality rate is attributed, in part, to the lack of water and to poor water quality.



Alumni News

Jack Beecher, M.P.H. '84, has been named to a new position, veteran liaison, by Yale University. A Vietnam veteran, Jack has worked for the university for almost three decades. In this new position, he will help Yale's veterans access services and resources on and off campus and recruit veterans to study on campus.

Patrick Byam, M.P.H. '08, has been named a DiverseCity Fellow by CivicAction. The organization brings together senior executives and rising leaders from all sectors to tackle challenges facing the areas of greater Toronto and Hamilton, Ontario, Canada.

Heather N. Fowler, D.V.M., M.P.H. '11, received the Bullitt Foundation's \$100,000 Environmental Fellowship Award. She will assess conventional and organic dairy practices in Washington state and investigate issues affecting human, animal and environmental health.

Jewel M. Mullen, M.D., M.P.H. '96, has been named principal deputy assistant secretary for health at the U.S. Department of Health and Human Services (HHS). In this position, she oversees offices within the Office of Assistant Secretary for Health, with the goal of fostering collaboration across its programs to advance public health. Jewel is the lead liaison for the HHS Regions and advises the Acting Assistant Secretary for Health on a variety of public health issues, ranging from research integrity to women's health to health promotion and disease prevention.

Ruchit Nagar, M.P.H. '16, a founder of Khushi Baby, won a Wearables for Good challenge sponsored by UNICEF. Khushi Baby, winner of the 2014 inaugural Thorne Prize for Social Innovation in Health or Education at the Yale School of Public Health, is a necklace that stores electronic health data, providing a two-year personal immunization record for children. The technology is being implemented in India.



Angela Ni, M.P.H. '03, a trial attorney focused on pharmaceutical patent litigation, was honored with the City Bar Justice Center's 2015 Jeremy G. Epstein Award for her pro bono service to veterans.

O'dell M. Owens, M.D. '76, M.P.H. '76, has been named medical director of the Cincinnati Health Department. In this position, he will oversee health care for thousands of residents who seek treatment from the department's seven community health centers. The centers recently recorded nearly 95,000 visits for primary, vision and dental care.

Angela Y. Shih, M.S. '01, M.P.H. '03, and Dr. Albert Cheng-Chia Li were married in June 2015 at St. Rose of Lima Church in Short Hills, N.J. Angela is a vice president and an associate medical director in the medical and scientific affairs group of CDM New York, a health care advertising agency.

Irene Trowell-Harris, R.N., M.P.H. '73, Ed.D., has a new memoir, *Bridges: A Life Building & Crossing Them*, published by Fortis Publishing. Irene was the first female and nurse to command a medical clinic and the first African-American woman in the history of the National Guard to be promoted to general officer. She retired in 2013 as director of the Department of Veterans Affairs Center for Women Veterans.



Have an update?

Your classmates want to hear about you! Help us share your news of a new job, promotion, recognition, marriage, birth of a child, etc. Send items (and photos) to ysph.alumni@yale.edu.



Rosalind D'Eugenio

Caribbean health

Nations gather at Yale to address growing threat of chronic diseases.

Noncommunicable diseases – such as diabetes, cancer and hypertension – have become epidemic in the Caribbean, replacing infectious diseases as the leading cause of death.

In response to the region's growing public health crisis, the Global Health Leadership Institute (GHLI) at Yale partnered with the Eastern Caribbean Health Outcomes Research Network (ECHORN) to facilitate a regional approach to chronic disease prevention and management. Senior health practitioners, policymakers and researchers from Barbados, Puerto Rico, Trinidad and Tobago and the U.S. Virgin Islands traveled to New Haven last summer and worked with Yale experts and others to address growing health challenges in their countries.

"It's exciting to focus on a particular region, because it gives us the opportunity to bring together colleagues and to problem solve issues in their own context. It's a great opportunity to learn from one another," said Michael Skonieczny, GHLI executive director.

The weeklong event, hosted by Elizabeth H. Bradley, Ph.D. '96, professor at the Yale School of Public Health and GHLI faculty director, sought to use science and research findings to bring about policy and practice changes in specific settings.

Each country's delegation identified a public health threat that needs to become a national priority:

- Barbados identified diabetes, the number-one underlying cause of death in 2008. Diabetes accounts for the highest proportion of deaths among women. One in five adults in Barbados has type 2 diabetes.
- Puerto Rico targeted childhood obesity. Unbalanced nutrition, inactivity, unhealthy food environments, cultural factors, pre-existing medical conditions and other factors have contributed to the obesity problem.
- Trinidad and Tobago targeted alcohol abuse. The high rate of binge drinking and alcohol abuse among the young has been increasing.
- The U.S. Virgin Islands identified the high prevalence of diabetes and hypertension. The USVI are also dealing with problems associated with health insurance and the number of people who are uninsured.

Robert J. Alpern, M.D., dean of the Yale School of Medicine, welcomed the delegates to the Greenberg Conference Center by reflecting on Yale's long tradition of basic science research. He said he was happy to see it expand to include translational research, "which affects people in a more immediate sense." Referring to obesity and smoking, he said, "We know they are preventable, but they are still going on and are wiping out populations. This is the problem of the next two decades. We have the mechanisms to beat these diseases."

Marcella Nunez-Smith, M.D., M.H.S. '06, ECHORN's principal

investigator and associate professor at the Yale schools of medicine and public health, highlighted ECHORN's primary research project, a study focused on collecting and analyzing data on the prevalence and risk and protective factors of diabetes, cancer and cardiovascular disease.

Nunez-Smith said ECHORN chose the four sites because "they represent a diversity in race/ethnicity, language and health care delivery systems and are not traditional partners." Not only does ECHORN expand clinical and behavioral research with racial/ethnic minority populations, but its work also has direct implications for health research, practice and policy in the Caribbean. Further, even though the data collected from the cohort study are island-specific, there are regional commonalities.

Jose A. Capriles-Quirós, M.D., associate dean of academic affairs at the University of Puerto Rico, said the forum helped him envision how to complete a national food policy. Information gathered at the forum has inspired him to think about using advertising and marketing strategies.

In Trinidad and Tobago, Wendy-Ann E. Wattie, coordinator of the Ministry of Health's National Alcohol and Drug Abuse Prevention Programme, said the country's roots as a plantation society have created an environment in which alcohol "is a way of life." Sharing the information and ideas that came out of the forum will be tremendously beneficial in fighting this entrenched scourge, she said.

Jennifer Kaylin

Ebola quarantines medically unjustified, unconstitutional, Yale-ACLU report says

Yale students follow report with federal civil rights lawsuit against Connecticut.

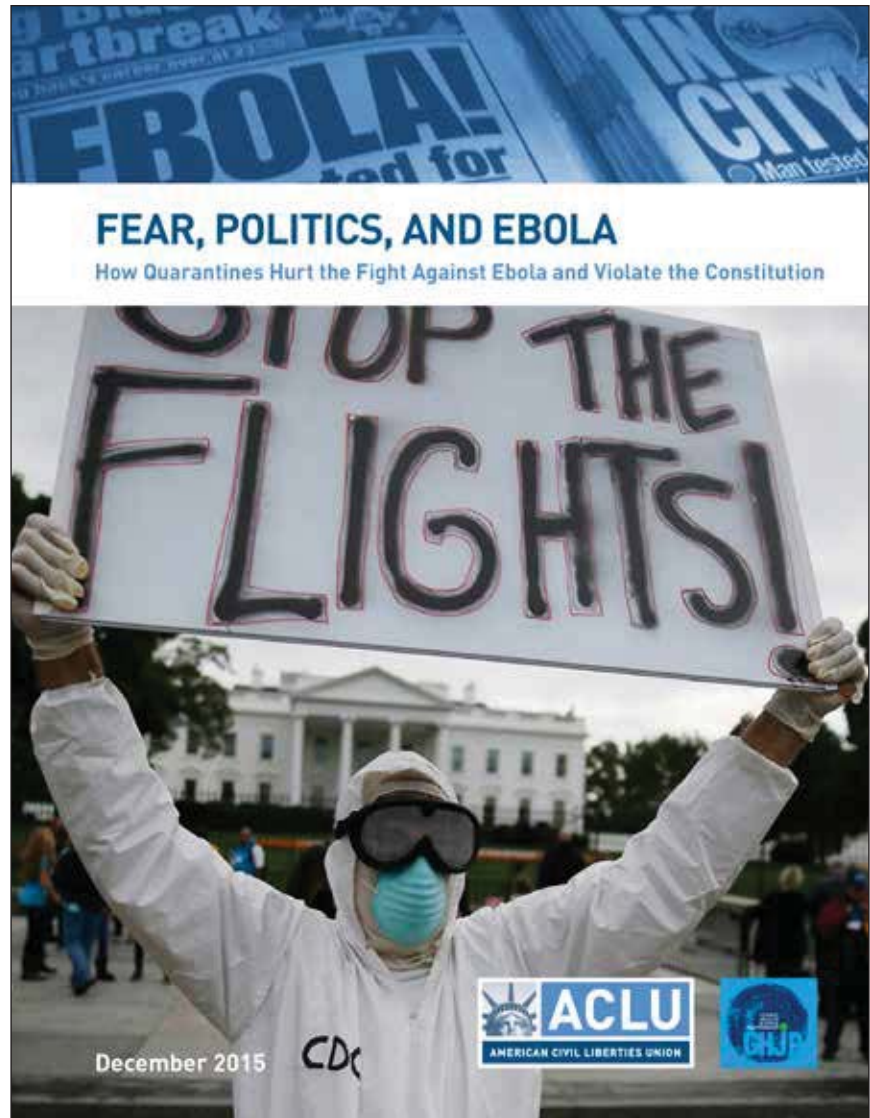
A 46-page report examining the U.S. response to the 2014–2015 Ebola epidemic warns against politically motivated and scientifically unwarranted quarantines, which the report found violated individuals' rights and hampered efforts to fight the disease by discouraging American doctors and nurses from going abroad.

The report—*Fear, Politics, and Ebola: How Quarantines Hurt the Fight Against Ebola and Violate the Constitution*—was written by students and faculty of the Yale Global Health Justice Partnership (GHJP), which is a joint program of the Yale School of Public Health and Yale Law School, and the staff of the American Civil Liberties Union.

Mandatory quarantines affected two Yale School of Public Health students who traveled to Liberia during the height of the epidemic to aid the government's response. Ryan Boyko, a former student and one of the paper's authors, was quarantined when he returned from Liberia in October 2014. Laura Skrip, also a doctoral student, was placed in quarantine as well (see separate story on Skrip on page 32).

Students at the Yale Law School filed a federal civil rights lawsuit against the state of Connecticut in 2016 over the forced quarantines.

The quarantines were not limited to Yale students. New Jersey Gov.



Chris Christie instituted a mandatory 21-day quarantine policy for all returning health care workers. Kaci Hickox, a Doctors Without Borders nurse who volunteered in Sierra Leone, was held in a tent outside a Newark hospital for three days before being allowed to return to her home state of Maine under an in-home quarantine. A judge ruled the entire quarantine unnecessary.

“The Ebola quarantines and other movement restrictions put in place throughout the nation beginning in late 2014 were motivated by fear and by politics, not by medical science,” said Gregg S. Gonsalves, co-director of the GHJP and a Ph.D. student at the School of Public Health. “We need to learn from the mishandling of the U.S. Ebola non-epidemic and respond

“The Ebola quarantines ... were motivated by fear and by politics, not by medical science.” – *Gregg Gonsalves*

to future health scares with smart policies based on decades of scientific evidence, not reactive policies based on misinformation and political grandstanding.”

The 2014–2015 Ebola epidemic killed approximately 11,000 people in Guinea, Liberia and Sierra Leone. Many American health professionals traveled to the region to help, as they have for decades during past outbreaks of Ebola and other infectious diseases. The science is clear on the fact that the Ebola virus, while very dangerous for those infected, is difficult to transmit. People without symptoms are not contagious. In order for Ebola to spread, a person must come into direct contact with the bodily fluids of someone who has fallen ill, and the risk of transmission is highest later in the disease.

Guidelines from the Centers for Disease Control and Prevention do not recommend quarantines for people not showing symptoms, but the guidelines are not binding. By December 2014, at least 23 states had announced quarantine and movement restriction policies that exceeded the CDC guidelines. The exact number of people who were quarantined or otherwise restricted in their movements is unknown, but the report’s review of media stories shows that hundreds of returning aid workers

were affected. The report found that these people were illegally deprived of their right to due process under the 14th Amendment because the quarantines and movement restrictions were not scientifically justified.

The consensus of the medical community is that the best way to prevent diseases like Ebola from spreading to the United States is to fight them at their source. But the report found numerous cases of health workers who were discouraged from volunteering in West Africa because of the new policies.

The report includes seven recommendations for federal, state and local officials. Among them are:

- Asymptomatic individuals who present no real risk of transmission should not be quarantined or have their movement restricted.
- Authorities should employ the least restrictive alternatives available to stem the transmission of an infection.
- Authorities should provide robust procedural protections.

The GHJP was established in 2012 to promote interdisciplinary, innovative and effective responses to global health disparities.



REIDS re-funded

Program to train diverse scholars receives \$1.3 million grant.

After Donna Cole completed her doctorate in sociology from Northeastern University in 2005, she thought about some of the HIV/AIDS fieldwork she had done and realized that what really sparked her interest was community-based research on the disease.

“I was interested in being in the community, talking with people about how they were managing their HIV infection diagnoses,” she said.

That inspired Cole, Ph.D., M.P.H., to apply for a REIDS (Research Education Institute for Diverse Scholars) fellowship at Yale. She was accepted as a REIDS scholar from 2013 to 2015.

Created five years ago, REIDS was recently re-funded for another five years with a \$1.3 million grant from the National Institute of Mental Health. Yale’s Center for Interdisciplinary Research on AIDS (CIRA) runs the program.

Since its inception, 17 scholars have completed the REIDS program. Each has done a pilot project, which takes one to two years. “It’s very intense,” said Barbara Guthrie, R.N., Ph.D., REIDS co-director and a professor emerita at the Yale School of Nursing. “They have to do a lot of work in a compressed time.”

The program is intended to meet the challenges and barriers to advancement experienced by diverse researchers who are underrepresented in the field of HIV research. It provides opportunities for fellows to develop the skills needed to conduct community-based implementation science research



REIDS

Research Education Institute
for Diverse Scholars

and advance HIV-inequalities research. The program is aimed at junior faculty – assistant professors and postdoctoral fellows – who are seeking educational support and mentoring.

“This program provides diverse scholars with the additional support, infrastructure and mentoring that facilitate their academic and professional success,” said Trace Kershaw, Ph.D., associate professor at the School of Public Health and co-director of REIDS. “Yale and academia need more programs like REIDS that prioritize diversifying the research community, which results in a better academic environment and better science.”

REIDS has four major components: a four-week summer institute for each of two consecutive summers; online monthly meetings on grant writing and professional development; intense mentoring from CIRA-affiliated researchers; and a \$20,000 grant to conduct a pilot study in community-based implementation science.

Recent REIDS pilot projects include Engagement and Retention of Care: Positive Sistahs’ Engagement for Life; Sexual Health Promotion Among African American Adolescents in Rural North Carolina; and *Dímelo* (which means “tell me”): How Does Culture Influence Your Life?

REIDS addresses “a real gap,” said Guthrie. A disproportionate number

of HIV/AIDS patients are people of color, so it is helpful when the researchers interacting with them are also people of color, Guthrie said. “They ask different questions. They go out and talk with people.”

Guthrie cited another REIDS scholar’s research project, Feasibility of a Church-Based HIV Test and Treatment Model for African Americans. The researcher went into churches in Philadelphia and talked with congregants and pastors. “She raised questions that came from the people. It’s real community-based research,” Guthrie said.

While Cole has completed her REIDS training, she’s still at work on her pilot project: a study of stigma and how it shapes patients’ decisions to get the medical care they need. Cole, who is a lecturer at Central Connecticut State University and a visiting assistant professor at Simmons College, is in the process of getting her research published. Similarly, other REIDS graduates have successfully published in top-tier journals, obtained federal funding and been hired by and promoted at prestigious universities.

“What sets the REIDS program apart is its commitment to increasing the diversity of HIV/AIDS researchers,” Cole said. “It’s definitely helping.”

Jennifer Kaylin

“We saw improvements in some key risk areas.”

—Alycia Santilli

A healthier Elm City

A door-to-door survey to gauge New Haven’s health found encouraging signs that city residents are adopting fitter lifestyles.

CARE, the Community Alliance for Research and Engagement, a research group at the Yale School of Public Health, surveyed 1,189 residents late last year in six of the city’s most disadvantaged neighborhoods. Participants responded to questions about their health status, health-related habits and barriers to better health. It was CARE’s third survey of the same neighborhoods since 2009. Data from the latest survey were released in March.

“We saw improvements in some key risk areas,” said Alycia Santilli, M.S.W., CARE deputy director and chair of the New Haven Food Policy Council. Food insecurity dropped, from 41 percent three years ago to 34 percent today. “This may be a sign that the economy is getting better for low-income residents.”

The survey also identified an increase in the number of people who feel safe in their neighborhoods. In 2012, 33 percent of residents said they felt unsafe walking in their neighborhood during the day and 67 percent said they felt unsafe at night. Those numbers dropped to 14 percent and 51 percent, respectively. “That may be due, in part, to increased community policing,” Santilli said.

Another encouraging finding is that 95 percent of respondents now have health insurance, up from 88 percent in 2012.

Although 65 percent of residents in the surveyed neighborhoods meet

the recommended amount of exercise (more than 150 minutes weekly) — an increase from 59 percent in 2009 and 2012 — overall improvement is still needed in areas such as active living and better nutrition.

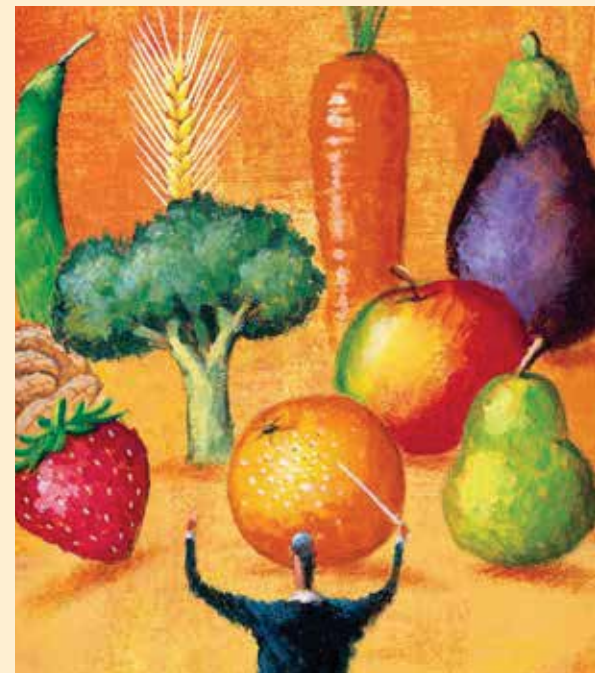
“We need to build communities that make it easier for residents to engage in healthy behavior, while also putting more emphasis on exercising and eating more fruits and vegetables,” said Santilli. Some progress has already been made in these areas. For example, CARE, in collaboration with community residents, has established community gardens. Additionally, local nonprofit CitySeed brings mobile produce markets into low-income neighborhoods. And community groups have designed walking and biking trails, designated with CARE-supported signage and supported by the City of New Haven Department of Transportation, Traffic and Parking.

Smoking rates, however, remain largely unchanged, holding steady at 29 percent, according to the latest survey. An encouraging development is that 44 percent of smokers said they tried to quit in the past year. “People want to quit, but they need better tools and incentives,” Santilli said. The city recently passed a smoking ban in city-owned or -operated parks, beaches, school grounds and buildings. Using CARE data to guide policies and practices, together with targeted resources from the New Haven Health Department, Santilli hopes to see a drop in smoking rates.

CARE seeks to reverse disproportionately high rates of chronic diseases in the city’s underserved neighborhoods

through changes to the structural environment and with programs and policies that encourage exercise, healthier eating and reduced rates of obesity and smoking. Forty-five percent of survey respondents reported noticing changes in their neighborhood in the past three years that are health-enhancing.

J.K.



Six neighborhoods surveyed:

- * Dixwell
- * Fair Haven
- * Hill North
- * Newhallville
- * West River/Dwight
- * West Rock/West Hills

Veteran researcher, leading tick expert retires

Durland Fish honored with festschrift celebration by friends and colleagues.

Scholars, colleagues and friends gathered last year to honor the career and many accomplishments of Professor Emeritus Durland Fish, an ecologist and prominent entomologist with specialties in tick- and mosquito-related diseases, who retired after a career that spanned nearly four decades.

The daylong festschrift celebration in Winslow Auditorium included associates from his early days as a teacher at Fordham University, former students who have become accomplished scientists in their own right and current and former colleagues from the Yale School of Public Health where Fish, Ph.D., spent the last 22 years of his fruitful career.

Fish began his career as a sanitarian for the Pennsylvania Department of Health when a fatal case of Rocky Mountain spotted fever inspired him to pursue a research career in public health entomology. His accomplishments include the first recognition of the peridomestic nature of Lyme disease and the development of new methods for preventing tick-borne disease. He created the first Lyme disease risk map that utilized smartphone technology to keep people informed of a public health threat, and he mapped the spread and virulence of Lyme disease throughout the United States. His field research resulted in the discovery of emerging tick-borne diseases and investigation of the West Nile virus outbreak at the Bronx Zoo,



Durland Fish

as well as outbreaks of dengue and chikungunya on the Caribbean island of Dominica.

With an early interest in exploring nature, Fish described the first aquatic spittlebug during an expedition to Costa Rica and discovered a new species of mosquito on Mount Roraima, an isolated peak in Venezuela. This insect was named in his honor: *Wyeomyia fishii*.

In retirement, Fish continues to do field studies in the Florida Everglades that explore the role of mosquitoes and mosquito-borne viruses in a wetland wilderness.

“The Yale School of Public Health has provided the best opportunity for me to integrate my interests in both nature and public health,” said Fish. “I know of no other institution where this can be done so well.”

Fish said that he is proudest of his contributions that demonstrate the value of field studies in understanding

the epidemiology of insect-borne disease and also of the many outstanding students he has mentored over the years.

At Yale, Fish collaborated with colleagues from across the campus, including the Yale School of Medicine and the Yale School of Forestry & Environmental Studies. He founded and directed the Yale Institute for Biospheric Studies Center for EcoEpidemiology and served on the steering committee of the Yale Climate & Energy Institute. At the School of Public Health, he oversaw a “tickery” that boasted one of the largest collections of live ticks in the world: some 50,000 spider-like insects in all stages of life and carrying a host of disease-causing microbes. It is an invaluable resource for research at Yale and beyond.

Dean Paul Cleary described Fish as a “giant” among those who have studied the ecology, epidemiology and prevention of vector-borne disease. His work on tick-borne pathogens has been pathbreaking and hugely influential, and his scientific research findings have been disseminated through more than 100 scholarly publications.

Cleary said that Fish never retreated to the “ivory tower” but always maintained a network of field sites that have allowed him to study vector-borne diseases where they have the greatest impact and to introduce generations of students to the complexities and excitement of fieldwork.

“The national and global community has benefited from Durland’s insights and science, and we are incredibly privileged to have him as a member of the YSPH community,” Cleary said.

His colleague at the School of Public Health, Peter J. Krause, M.D., said that Fish's inherent curiosity about nature prepared him well for a career focused on emerging diseases and the health threat they pose to the public. While the findings of his scientific research were sometimes at odds with popular belief, he remained steadfast.

"Durland has been a forceful leader in recognizing the importance of vector and reservoir host ecology in our understanding of these diseases and in combating nonscientific and sometimes harmful approaches to the diagnosis, treatment and prevention of Lyme disease and other emerging tick-borne diseases," Krause said. "His kind and generous manner, meanwhile, has made him beloved by his colleagues, students and friends."

Fish co-authored the 2006 Infectious Diseases Society of America Guidelines that set the standard for diagnosis and treatment of Lyme disease, anaplasmosis and babesiosis. He was also the founder and initial editor-in-chief of the first journal exclusively focused on vector-borne diseases, *Vector-Borne and Zoonotic Diseases*, and was a co-founder of the American Lyme Disease Foundation.

Late in his career, Fish was named the School of Public Health's Distinguished Student Mentor, a recently created award to recognize a faculty member who has had an exceptional impact on his or her students.

Fish described the award—which is voted upon by the students—as the highest professional honor of his career.

Michael Greenwood



Alison Galvani

Galvani's appointment makes history at Yale

At the age of 38, Alison P. Galvani was named the Burnett and Stender Families Professor of Epidemiology, the youngest faculty member ever appointed to a named professorship in the history of the Yale School of Medicine and YSPH.

The honor was bestowed in 2015 and recognizes Galvani's groundbreaking research on applications of epidemiology and evolutionary ecology in the study of numerous diseases.

Galvani, Ph.D., director of the recently formed Center for Infectious Disease Modeling and Analysis (CIDMA), has interdisciplinary and wide-ranging research interests. She has published over 150 articles in journals, including *Science*, *Nature*, *PNAS* and *The Lancet*. Her research, in turn, has stimulated many important studies and subsequent articles by

others and has improved national and international public health policies.

"An endowed chair is one of Yale's highest honors and a wonderful affirmation of the important research that Dr. Galvani has done and continues to do," said Paul Cleary, dean of the Yale School of Public Health. "This chair, which is the first new chair at YSPH in almost 50 years, will ensure support for important research on infectious diseases in perpetuity."

In 2014, Galvani and members of her team at CIDMA published a series of papers in quick succession on the unfolding Ebola outbreak in West Africa. The papers addressed strategies for containing the outbreak and preventing further deaths. Her research in collaboration with the Liberian Ministry of Health and Social Welfare guided policy decisions and included the design of technologies that helped end the outbreak. (See full story on Galvani's work beginning on page 12.)

Galvani has received numerous awards during her career, including the Blavatnik Award for Young Scientists from the New York Academy of Sciences (2012), the Bellman Prize (2013), a fellowship from the Institute for Advanced Study in Berlin (2006), the Yale MacMillan Center Director's Award (2006), the John Simon Guggenheim Memorial Foundation Fellowship (2006) and the American Society of Naturalists Jasper Loftus-Hills Young Investigator Award (2005).

M.G.

Centennial lectures



2015 celebration draws public health giants to YSPH.

Public Health 2.0

Over the past 100 years – the age of the Yale School of Public Health – advances in public health have made enormous contributions to human well-being and quality of life.

Air quality standards have been implemented, health departments established, diseases eradicated, life expectancy increased and infant mortality reduced, among many other gains.

And yet, in the early stages of the 21st century, the environmental health of the planet is in jeopardy, as humans exploit natural resources to further drive industrialization and economic progress.

This ongoing degradation – such as shrinking rainforests, severe clean-water shortages and rising world temperatures – poses serious challenges to human health and threaten to reverse many of the gains that have been made.

In a Centennial C.-E.A. Winslow Medal Award lecture, Judith Rodin, Ph.D., president of the Rockefeller Foundation, called for a new approach to public health – Public Health 2.0 – that embraces planetary health in order to sustain and advance human health.

“The connection between the health of our planet and our own

health is abundantly clear,” Rodin told a large gathering in the lecture hall at the Yale University Art Gallery on November 2.

Rodin was the third recipient of the Winslow Medal in 2015, during the school’s centennial celebration. Sir Michael Marmot and Anthony S. Fauci, M.D., were each awarded the medal earlier in the year.

The Winslow Medal recognizes leaders in public health research, education and practice and is the school’s highest honor. It is named after Charles-Edward Amory Winslow, who founded public health at Yale in 1915 and is recognized today as a seminal figure in the early American public health movement. He led the school for some 30 years before his retirement in the mid-1940s.

The end of AIDS?

Since the early 1980s, HIV/AIDS has claimed tens of millions of lives. The pandemic has touched every corner of the world, affected young and old, rich and poor and men and women of all backgrounds.

It has been one of the worst scourges in human history, said Anthony S. Fauci, M.D., a leading HIV/AIDS researcher and director of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health, during an October 23 lecture upon receiving the Centennial C.-E.A.

Winslow Medal Award from the Yale School of Public Health. Fauci was the second medal recipient during the year-long centennial celebration.

An immunologist by training, Fauci has made important contributions to the understanding of how HIV attacks the body’s immune system, as well as to the development of therapeutic strategies. He has also authored, co-authored or edited more than 1,270 scientific papers, and several textbooks, and is a key adviser to the White House on HIV/AIDS policy, including the PEPFAR program, credited with saving millions of lives around the world.

Fauci began with a grim overview of the devastation wrought by HIV/AIDS over the past 35 years. There have been some 76 million infections and 34 million deaths internationally. Approximately 37 million people currently live with the virus, and there were 1.2 million deaths and 2 million new infections in 2014 alone.

Fauci, however, was also optimistic that the deadly virus will eventually be defeated. “It’s almost inevitable that it will happen, if we do a few things,” he told hundreds of people gathered in Harkness Auditorium.

Greeted by a host of old friends and Yale HIV/AIDS research colleagues, Fauci received a standing ovation at the end of his remarks for his decades of work in the front lines against a virus that has taken a terrible toll.

Left to right: Judith Rodin; Anthony Fauci; Vivek Murthy; Michael Marmot.



A “golden age” of health

Good health drives everything.

Without it, the United States will not succeed in education, economic development or virtually any other endeavor.

U.S. Surgeon General Vivek H. Murthy, M.D. '03, M.B.A. '03, told a gathering at the Yale School of Public Health on September 14 that a “golden age” of public health is within reach, an epoch marked by fairness and equality, where different sectors unite in the common cause of promoting health for all citizens.

“Public health is a key foundation for our country,” he said. “It is our collective responsibility to help the world understand this. We need young faculty and young students to step up and be part of this larger transformation in our country and around the world.”

Murthy visited the school to deliver a Milbank Lecture, one of seven that were held throughout 2015 to celebrate a century of public health at Yale.

Describing him as “America’s doctor,” Yale President Peter Salovey introduced Murthy to the capacity audience in Winslow Auditorium (along with nearly 100 other people who watched the lecture in real time in several nearby rooms).

Salovey, Ph.D. '86, noted that Murthy’s interest in public health stems from his childhood, when he spent time in his father’s Miami

medical clinic. Today, much of his work revolves around issues such as reducing obesity and tobacco use, improving vaccination rates, decreasing the stigma associated with mental illness and promoting disease prevention.

As Surgeon General, Murthy is responsible for communicating the best available scientific information to the public regarding ways to improve personal health and the health of the nation. He oversees the operations of the U.S. Public Health Service Commissioned Corps, which comprises approximately 6,800 uniformed health officers who promote, protect and advance the health and safety of the United States.

The crisis of health inequality

Recent rioting in Baltimore followed the death of a black man in police custody, but the larger source of the crowd’s anger was widespread inequality and everyday deprivation.

Speaking to the Yale School of Public Health’s centennial graduating class on May 18, Sir Michael Marmot told a rapt audience that health and economic disparities in the United States (and elsewhere) are straining the foundations of civil societies.

Marmot, Ph.D., who had recently visited sections of Baltimore, said that he found two vastly different cities separated by a mere 10-minute car trip. One section was marked by expensive homes and obvious privilege. The

other section was filled with abandoned buildings and an air of hopelessness. What’s more, the life expectancies of people living in the two neighborhoods reflected their surroundings. People in the more affluent enclave live an average of 83 years, while residents in the poorer section live an average of 63 years.

One’s mailing address, he noted, can add or subtract 20 years of life.

“We have in our hands the means to close [this] gap in a generation. The question is, what do we have in our hearts?” he asked the gathering.

Marmot was the first centennial-year recipient of the C.-E.A. Winslow Award, the School of Public Health’s highest honor. He has led research on health inequalities and their influence on health for 35 years. An internationally recognized scholar, he served as chair of a World Health Organization committee studying the social determinants of health and produced a report, *Closing the Gap in a Generation*, on the topic. Knighted in 2000, Marmot is a professor of epidemiology and public health at University College London.

Michael Greenwood



Larger than life



* Northern house mosquito, *Culex pipiens*,
75x life-size



* Deer tick, *Ixodes scapularis*,
100x life-size



* Human bedbug, *Cimex lectularius*,
100x life-size



* Cat flea, *Ctenocephalides felis*,
100x life-size



* Human head louse, *Pediculus humanus capitis*, 100x life-size



* Human pubic louse, *Phthirus pubis*,
100x life-size



Leonard Munstermann

Invasion of the bloodsuckers

Giant bedbugs. Enormous ticks. Mammoth mosquitoes.

An exhibition featuring models of six larger-than-life blood-sucking arthropods – up to 100 times their actual size – remains on display in the lobby of the Yale School of Public Health at 60 College Street.

Two of the creatures, the northern house mosquito and the human bedbug, are each in a “blood-feeding posture.” Another, the human head louse, is “laying eggs on a human hair,” while the cat flea is “preparing to leap.” The deer tick, meanwhile, is “in search of a host,” and the human pubic louse is clinging to a human hair.

Each of the featured insects has a unique set of adaptations that have evolved in close association with its hosts, said Leonard E. Munstermann, Ph.D., a senior research scientist at the

Yale School of Public Health and curator of entomology at the Yale Peabody Museum of Natural History.

The models were developed with a National Institutes of Health grant and were originally displayed at the Peabody Museum as part of an exhibition, *Invasion of the Bloodsuckers: Bedbugs and Beyond*, which opened in 2011. Munstermann, who was the principal investigator of the grant and curated the exhibition, said that the sculptures are all anatomically correct and “as true to life as is humanly possible.”

Michael Anderson, the artist who created the giant Torosaurus sculpture that stands in front of the Peabody, worked with Munstermann to create the creatures. They observed microscopic specimens in order to build the macroscopic models.

Jennifer Kaylin

Awards and Honors

Serap Aksoy, Ph.D., professor in the Department of Epidemiology of Microbial Diseases, was selected as a fellow of the Entomological Society of America.

Michael B. Bracken, M.P.H. '70, Ph.D. '74, the Susan Dwight Bliss Professor of Epidemiology (Chronic Diseases), received an Honorary Doctorate of Science from the University of Gloucestershire in Britain.

Elizabeth H. Bradley, Ph.D. '96, professor in the Department of Health Policy and Management and director of the Global Health Initiative and Global Health Leadership Institute, was one of 10 women honored in November 2015 by the Connecticut Women's Hall of Fame for their global impact.

Emily Bucholz, M.D. '15, Ph.D. '15, was awarded the M.D./Ph.D. Thesis Prize for 2014-2015. She was matched for residency with the Boston Combined Residency Program at Boston Children's Hospital and Boston Medical Center.

Kirsty Clark, a 2016 M.P.H. graduate from the Division of Social and Behavioral Sciences, won a Claro Mayo Grant in support of work on sexism, racism or prejudice from the American Psychological Association.

Durland Fish, Ph.D., professor emeritus in the Department of Epidemiology of Microbial Diseases, received the Harry Hoogstraal Medal for Outstanding Achievement in Medical Entomology from the American Society of Tropical Medicine and Hygiene.



Joan Monin

Judith H. Lichtman, M.P.H. '88, Ph.D. '96, chair of the Department of Chronic Disease Epidemiology, was elected a fellow of the American Heart Association/American Stroke Association. She has also been named to two leadership positions with the American Heart Society Council on Epidemiology and Prevention: chair of the Stroke Statistics Subcommittee, and Stroke Council liaison to the leadership committee. She has also been elected to the Council for the Organization for the Study of Sex Differences, founded by the Society for Women's Health Research.

Robert W. Makuch, Ph.D. '77, professor in the Department of Biostatistics, was awarded a guest professorship at Shandong University in China.

Sarah Maver, a 2016 M.P.H. graduate from the Division of Social and Behavioral Sciences, was awarded the Jessie C. Obert Memorial Scholarship by the Academy of Nutrition and Dietetics Foundation.

Joan K. Monin, Ph.D., assistant professor in the Department of Chronic Disease Epidemiology, received an Early Career Award from the Society of the Study of Human Development.

Adedotun Ogunbajo, a 2016 M.P.H. graduate from the Division of Social and Behavioral Sciences, presented his paper, "The Association Between Social Support and Condom Use in a National Sample of Young Black Men Who Have Sex with Men (YBMSM)," at the Inaugural Forum on Population Health Equity at Harvard University.

Rafael Pérez-Escamilla, Ph.D., professor in the Department of Chronic Disease Epidemiology and director of the Global Health Concentration and the Office of Public Health Practice, received an *honoris causa* doctorate from the University of Guadalajara in Mexico. He also received the *Journal of Human Lactation's* 2015 Patricia Martens Annual Award for Excellence in Breastfeeding Research and has been appointed senior co-editor of *Maternal & Child Nutrition*.

Zika's rise. Since the appearance last year of the Zika virus in the Americas, Professor Albert Ko has been working with colleagues in the Brazilian city of Salvador on the epidemic and the sharp increase in the number of cases of microcephaly in the offspring of those infected.

Ko and others are working to help babies and their parents affected by the condition – which is marked by a smaller-than-normal head circumference and, usually, diminished cognitive ability – as well as investigating other possible consequences of the mosquito-borne virus and the risks that it poses to humans.

Ko has said that microcephaly may be the “tip of the iceberg” in terms of the danger posed by the virus.

YSPH around the world

United States. Fifty-six original health-themed posters, developed by Yale public health and art students, were displayed at Oglethorpe University Museum of Art in Atlanta in March and April.

Liberia. School of Public Health researchers determined that hundreds of Liberians died from tuberculosis and malaria as a result of a health care system crippled by the 2014 Ebola epidemic.

China. A delegation of mayors from various Chinese cities visited Yale in May and met with YSPH scientists to learn more about issues surrounding health care and health threats posed by rapid urbanization.



Haiti. The country's devastating cholera epidemic following the 2010 earthquake could have been largely avoided with simple – and inexpensive – interventions, published research by the Yale schools of public health and law found.

India. A student-led health intervention, Khushi Baby, is being implemented in rural areas to provide improved immunization records for young children. The innovation utilizes a computer chip that is embedded into a necklace and worn by the child.

Samoa. A YSPH researcher and colleagues identified a gene that may contribute to widespread adult and child obesity in Samoa.

In Memoriam

Constance C. Azzi, M.S. '59, died on October 28, 2015, after a two-year battle with ovarian cancer. She was a U.S. Public Health Service Fellow while at Yale and earned a doctorate from Boston University in organizational behavior and political science. She held leadership positions in a number of national organizations over her 40-year career. Constance was chief executive of the federally funded New Hampshire Foundation for Medical Care, establishing peer review standards for the state's doctors and testifying before the U.S. Senate Finance Committee. She served as vice president of the National Service Center of the American Heart Association, overseeing all community programs in the country, and held a similar position at the American College of Emergency Physicians.

James E. Bowes, M.P.H. '62, died in Frederick, Md., on February 11, 2015, at the age of 94. He joined the Army Reserves and was in private practice in Salt Lake City, Utah. James was instrumental in the national polio and measles vaccination program and was the medical director for the Special Olympics under Eunice Shriver. He worked for Dow Chemical in Indianapolis, promoting the measles vaccine internationally, and in 1975 he became the head of epidemiology at the Marion County Public Health Department.

Willard "Ward" Cates Jr., M.D. '71, M.P.H. '71, died on March 17, 2016, at the age of 73. After graduating with an undergraduate degree in history from Yale, he traveled to England for a fellowship at King's College at Cambridge University, where a rugby

injury sparked his interest in and lifetime passion for medicine and public health. Upon his return to the states, he was the first to complete a combined M.D./M.P.H. degree at Yale. Ward did a two-year fellowship with the Centers for Disease Control and Prevention (CDC) in the Epidemic Intelligence Service, which helped to launch his long and storied career in reproductive and public health. He served as the first permanent chief of the Abortion Surveillance Branch at the CDC and later, at the dawn of the HIV epidemic, as director of the Division of Sexually Transmitted Diseases. He became an international HIV/AIDS expert and in 1994 was recruited to work as a researcher at Family Health International (now FHI 360).

Allen I. Cohen, M.P.H. '66, of Portland, Conn., died on January 2, 2016, at the age of 86. He served in the U.S. Air Force during the Korean War and held degrees from the University of Bridgeport and the University of Connecticut. Allen had a long career in the mental health field as a social worker and hospital administrator. He lived in Portland for the last 40 years.

John B. Dibeler, M.P.H. '48, of Gainesville, Ga., died on October 19, 2015, after a brief illness at the age of 91. He served in the Army Counter Intelligence Corps in Germany from 1947 to 1948 and as education director of the American Cancer Society in Philadelphia, pioneering extensive public education programs in the community and for employees of business and industry. John later served as executive vice president of the American Cancer Society on Long Island.

Mary O. Gabrielson, M.P.H. '52, died on August 16, 2015, at her home in Williamsburg, Mass. She graduated from Smith College in 1946 and earned a medical degree from the College of Physicians and Surgeons of Columbia University, where she met her husband, in 1950. Their careers in public health and medicine took them to Baltimore, New Haven, Berkeley and Philadelphia, where they were both members of the faculty of the Medical College of Pennsylvania until their retirement in 1989. Mary was deeply committed to women's health and family planning and was a practicing obstetrician/gynecologist.

John S.T. Gallager, M.P.H. '64, died on April 18, 2015, at the age of 83 at his home in Palm Beach, Fla. After leaving the family tire business to study public health, the Queens native was driven by a vision of a superior health care system. John joined the administrative staff at North Shore University Hospital in Manhasset, N.Y., in 1963 as an intern. He was named executive vice president in 1982. In the 1990s, when managed care started making inroads in New York, he developed a plan to integrate the health care system, joining multiple hospitals and care facilities across a broad geographic area to achieve economies of scale and to better negotiate with insurance companies and HMOs. He oversaw the merger of the North Shore Health System with the Long Island Jewish Medical Center to create the North Shore-LIJ Health System.

Susan Kaetz, M.P.H. '75, died on May 7, 2015, at her home on Vashon Island in Washington. She was 65. She graduated from

Boston University with a degree in psychology and received an M.P.H. in Health Education and Health Services Administration from Yale. She also completed a master's degree in acupuncture from the Northwest Institute of Acupuncture and Oriental Medicine (NIAOM) in Seattle. From 1987 to 1990, Susan was program director for the AIDS Education and Training Center at the University of Washington School of Medicine. She was a lecturer at the University of Washington School of Public Health and Community Medicine from 1987 through 1992.

Hans O. Lobel, M.D., M.P.H. '64, died on September 11, 2015. During the German occupation of Europe his mother was a member of the Resistance and hid university students and downed Canadian pilots in her attic in Holland. Hans graduated from medical school at the University of Utrecht, Netherlands, in 1958 and did his residency at the Bronovo Hospital in The Hague and an epidemiology residency in Albany, N.Y. In 1966, he was appointed the first full-time Centers for Disease Control and Prevention officer for malaria surveillance, which led to a career as a world-renowned malaria specialist.

Mary Ruth McConville Mogan, M.P.H. '55, died on December 6, 2014, in Madison, Conn., at the age of 93. She spent her professional career as a nurse in New York, except for active duty with the Army Nurse Corps during World War II. She continued as a member of the Army Reserve until her retirement with the rank of colonel in 1981. Mary graduated from St. Mary's School of Nursing in 1943.

She earned a bachelor's degree in public health nursing from the University of North Carolina at Chapel Hill in 1950 and later took courses in psychology and guidance at Syracuse University and completed health facility surveyor training at UCLA in 1972. She was active in Zonta International, a worldwide organization that seeks to advance the status of women.

Jeanne E. Paty, M.P.H. '52, died on June 10, 2015, at the age of 91. She received a bachelor of science in education from the University of Michigan in 1945 and returned to Hawaii, where she was born, in 1946 to teach physical education and serve as director of health education at the YWCA. In 1952 she received her M.P.H. from Yale under a Community Chest Scholarship. She was appointed chief of the Office of Health Education in the Territorial Department of Health in Honolulu in 1953. Following Hawaii's statehood, Jeanne became the director of health education for the state of Hawaii. For the next several decades she served the people of Hawaii by creating a public school health curriculum to educate children on issues of health and wellness.

Risë Phillips, M.P.H. '83, died on February 10, 2015, in her Los Angeles home at the age of 55. She supported the two largest lines of business at Blue Cross of California, and her work with the Los Angeles County Department of Health Services provided the statistical justification necessary to support housing and prevention interventions in the early days of the HIV/AIDS epidemic. While heading the business development and public

policy functions at the California Family Health Council, Risë worked on legislation in the U.S. Congress and at the California State Capital designed to safeguard and fund women's health care and reproductive rights. She joined the To Help Everyone Health and Wellness Centers in 2009 as president and CEO.

Betty Jacquelyne "Jackie" McCoy Reid, M.D., M.P.H. '79, died on November 21, 2015, on her 87th birthday in New York City. After completing her residency at Northwestern University, Jackie worked as a physician at the Chicago Board of Health, and after moving to Connecticut in 1970, she worked as a physician at the New Haven Board of Health and in the Personnel Health Service of Yale New Haven Hospital. From 1989 until her retirement in 2001 she worked at several locations in the Bronx, including the Soundview Medical Center.

Edith B. Sheehan, M.P.H. '61, of Quincy, Mass., died on February 14, 2015. She received her bachelor's degree in nursing from Boston College and worked for many years in the Boston public schools as a testing administrator. An avid reader and traveler, Edith visited Europe, China and Alaska. She participated in town meetings and will be remembered as a well-educated woman who took pride in her independence.

Send obituary notices to
ysph.alumni@yale.edu

Today



Celebrating 100!

Some 325 faculty, students, staff and alumni of the Yale School of Public Health turned out on a picture-perfect day on August 31, 2015 (just before the new school year began), for a special schoolwide photo marking the school's centennial. It took photographer Harold Shapiro and several assistants some 15 minutes to organize the multitude into the assembly you see here on the lawn of LEPH. Furthermore, Shapiro climbed 10 feet up a ladder to gain the right perspective. The image is believed to be the largest group photo in the school's 100-plus-year history. Dean Paul Cleary is in the center (kneeling, second row). How many people do you recognize?



Yale Public Health
60 College Street
P.O. Box 208034
New Haven, CT 06520-2034

Non-Profit
U.S. Postage
PAID
New Haven, CT
Permit No. 526



STAY INVOLVED AND CONNECTED

The School of Public Health offers a variety of services, information and opportunities for our alumni.

Stay informed about your school

Join the YSPH LinkedIn group: With nearly 700 members, our LinkedIn group is fast becoming the preferred way to network with friends and colleagues.

Like us on Facebook: With daily updates on research, faculty, students and alumni, our Facebook page is the place to go for the latest YSPH and public health news.

Follow us on Twitter: Join over 1,000 followers and get YSPH news in real time!

Watch us on YouTube: Engaging, informative stories and lectures—learn something new today.

Visit our website: The entryway for all things Yale School of Public Health. Read the digital edition of *Yale Public Health* and help to save trees.

Receive @YSPH, your alumni e-newsletter: For news, happenings, social events and more.

For additional information on these and other opportunities, visit publichealth.yale.edu/alumni/benefits.

Yale SCHOOL OF PUBLIC HEALTH

