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A LETTER FROM THE EDITORS

We welcome you to the Fall 2013 issue of the Stanford Journal of Public Health, a biannual undergraduate publication that seeks to connect the enthusiastic, widely distributed public health community at Stanford by encouraging scholarly discussion of today's most pertinent public health issues.

In this issue, we feature lifesaving innovations for the developing world, views on new additions to the Affordable Care Act, studies in neuroscience as they affect compassionate behavior, and other relevant and interesting articles. Be sure to catch first-hand, on-the-ground commentary by Stanford students in the Experience section, including Abhishek Venkataramana's work for the Stanford's Design for a Sustainable World project in rural Jordan and Molly McKinney's inspiration from her Critical Issues in Child Health course to volunteer at a pediatric clinic in the Honduras. These and other stories, along with innovative research meticulously compiled by our Research team, are a true testament to the impact the Stanford community is having on the public health landscape.

Since the Journal's founding in 2011, we have been fortunate enough to work with inspiring faculty and staff from all corners of campus, including the Stanford Office of Community Health, the Center for Innovation in Global Health, the Program in Human Biology, the Haas Center for Public Service, Stanford Service in Global Health, and the Sexual Health Peer Resource Center. We would like to thank The Bingham Fund for Student Innovation in Human Biology and the ASSU Publications Board for their continued generous support of our endeavors. And finally, we want to thank our talented and dedicated staff for making this all possible.

We hope you enjoy this issue of the Journal as much as we enjoyed making it. We welcome your thoughts and comments about our work, the public health community at Stanford, or an issue you would like to see us cover. Please don't hesitate to reach out to us at stanfordjournalofpublichealth@gmail.com

Sincerely,
Caroline Zhang '15
Andrew Liao '15

Caroline Zhang

Caroline is an Economics major and a minor in Political Science. She is currently conducting research on the history and contemporary role of paternalism in public health policy through the Center for Health Policy (CHP/PCOR) on campus. She hopes to use her interests to address pressing policy issues in domestic healthcare and international development. Through the Journal, she looks forward to shedding light on public health topics and solutions and enjoys connecting with the growing public health community at Stanford.

Andrew Liao

Andrew is a Human Biology major with a concentration in Behavior and Speech Development. He is interested in the effects of congenital diseases and physical trauma on early childhood development. Through the Journal, he hopes to raise awareness of public health concerns to the Stanford community.

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The policy section explores the intersection of public health research and innovation and its deployment in the real world. The section approaches health topics at the forefront of scientific debate by integrating legislative, ethical, and economic perspectives.

Working the Uniquely American Employer-Sponsored Insurance Phenomenon

Christina Wang

President Obama signed the Patient Protection and Affordable Care Act into law on March 23, 2010. Since then, the federal government has instigated various provisions of this comprehensive health reform, including the penalties and mandates with regards to businesses, large and small, providing health coverage for their employees.

The stipulations of the ACA on employers are two-fold. Firstly, large businesses, defined as those with more than 50 or more full-time employees, are incentivized to provide insurance to all employees. After January 1, 2015, businesses that "do not offer coverage and have at least one full-time employee who receives a premium tax credit" must pay a penalty of $2000 per full-time employee.[1] Small businesses, defined as those with fewer than 50 full-time employees, are exempt from these penalties. Secondly, small businesses can purchase qualified coverage through an exchange marketplace. Opening in January 1, 2014, the state-based Small Business Health Options Program (SHOP) Exchanges allows these small businesses to compare the prices, coverage, and quality of plans similar to how individuals participate in the individual market health insurance exchange.[2]

Even though the stipulations are not fully in effect until 2015, health policy experts and analysts have offered their mixed reviews and projections. In a study by Dr. Jay Bhattacharya of the Stanford School of Medicine, there is "considerable controversy about how employer will react to the act's implementation."[3] On one hand, the Congressional Budget Office estimates that penalty and pretax incentives will cause approximately seven million people to gain employer-based insurance in the long-run.[4] However, other analysts find that it may be "financially advantageous not to provide insurance at all, even after accounting for the Affordable Care Act's penalty."[3]

National surveys of businesses reveal a general lack of knowledge about the Act, as well as its impact on business budget and financial plans. According to a 2013 survey conducted by Mercer, 32% of employers surveyed knew little about the actual cost impacts of the new charges.[5] The same survey found that 23% of the employers were "still unsure of how they will keep track and record the hours of employees who work variable hours, as is required by the law in order to verify that all employees working 30+ hours are offered coverage."[5] While there appears to be confusion over how companies will logistically respond to the Act, Dr. Bhattacharya found that if "theoretical [employer] premium contribution levels [increased] by just $100," there could be as much as "2.25 million individuals to transition to exchanges." This phenomenon, called "employee dumping," could cause more individuals to get insurance through the individual marketplace and not through their employer.

Despite the mixed statistical response, there has been some anecdotal evidence on how businesses have responded to the Act's provisions thus far. Forbes reports that "Walgreen Co., will move its workers into a private health insurance exchange to buy company-subsidized coverage." Walgreens joins a few other small businesses in participating in a private exchange. This private exchange is different from the individual market in that each employer decides on a "subsidy

Some businesses, such as Walgreens Co., will move its workers into health insurance exchange to buy company-subsidized coverage. The employer mandate has challenged existing businesses to rethink their financial strategy when it comes to employer healthcare.

... that each worker will get to purchase coverage offered by the employer. Then, the employees take to the [business] exchange to select their coverage."[6]

There has also been anecdotal evidence of a few companies reducing hours for part-time employees or no longer providing coverage for part-time workers altogether. The Guardian reports that "Seaworld, which operates 11 entertainment parks across the US, capped hours for part time workers at 28, down from 32" while "Trader Joe's and Home Depot have said they will no longer provide medical coverage for part-time employees."[7] Beyond this anecdotal evidence, there does not appear to be evidence suggesting systematic trends in business responses to the employer mandate.

Will the incentives be sufficient for employers to behave as hoped? Former California Assembly member and Stanford professor Joe Nation believes that the answer is unclear "despite all the modeling and speculation." As an example, he brings up the following: "if you look at the enrollees [in the individual marketplace] today, on November 11th, there are only 100,000... I don't think anyone would have predicted that."[8]

It appears that actual employer responses to the Affordable Care Act will not necessarily abide with calculated economic predictions and financial reports. Statements from both supporters and opponents of Obamacare claims based on economic predictions could be better off waiting the time out and seeing how the people of the United States collectively decide to respond to the new systems of healthcare.

Joe Nation is a Professor of the Practice of Public Policy at Stanford University. He directs the graduate student Practicum in public policy and teaches policy courses on climate change, health care, and California state issues. His current research is focused on public finance and public employee pensions. He is also a Principal at his own consulting firm, where his clients include RAND, PG&E, and others.

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Prompting Early Prevention through a Patient-Focused System

Melodyanne Cheng

One consistent theme throughout American history is the rising costs of healthcare as a percent of U.S. gross domestic product (GDP).[1] Despite many attempts to reign in the constant growth of healthcare spending, the numbers have continued to rise each year. Estimates of the national health expenditure in the future continue to increase as well, expected to project to about 20% of GDP by 2021.[2]

The pressing concern of the costs of healthcare is one of the issues that the Patient Protection and Affordable Care Act (PPACA) addresses and attempts to rectify. This article will explore how the absence of a delivery care system focused on patients is a contributor to the rise in healthcare costs. A policy hoping to address the rising healthcare costs should ideally first address a reorganization of the delivery system because the current delivery system is clearly incapable of providing for the nation's needs, a fact that will become readily apparent.[3] This article will analyze why an ideal reorganization of the delivery system should result in a patient-centered healthcare delivery system, and how the PPACA addresses creating a more patient-focused healthcare delivery system in order to combat rising healthcare costs. The rising healthcare costs are ultimately due to many factors, but two major factors are first, the blind use of newer technology due to the technological imperative, and second, the shortage of primary care doctors.[4] Both issues contribute to excess, unnecessary spending that ultimately contributes to the rise in health care costs.[5]

Collectively, both issues ultimately arise due to the lack of a patient-centered delivery system. I will examine the shifts in primary and preventative care over time, explore the current state of the healthcare system as affected by the two significant causes of healthcare costs mentioned previously, analyze the possible solutions through which the PPACA will address the absence of a patient-focused healthcare delivery system, compare and contrast the relative shortcomings of such solutions, and finally culminate in a prediction of future outcomes in healthcare under the proposed PPACA policy.

The Organization of the US Healthcare System Historically Lacks a Patient-Centric Focus

Because the lack of a patient-centric system is dependent upon the rising costs of healthcare, and because the rising costs of healthcare are partly dependent on two core issues: one, a blind faith in newer technology and two, a shortage of primary care physicians, especially in rural communities, it is important to explore how the two core issues surfaced and developed throughout history.

Throughout our history, the issue with the rising costs of health care extends to the beginning of the healthcare system, specifically to the organization of the U.S. healthcare system itself. The U.S. healthcare system ironically is organized to uphold the fundamentals of individualism, yet ultimately lacks a patient-centric focus. American doctors and professional medical organizations, especially the American Medical Association, established command over the majority of medical care-related structures, including hospitals, drug companies, and even insurance companies; thus, there is a fine balance between fulfilling self-interest and acting for the good of society, and physicians run the risk of choosing the temptation of money and self-betterment over their patients' wellbeing. Due to such a distinctive physician-empowered organization of the American healthcare system, doctors are able to charge "usual, customary, and reasonable" fees that are, in actuality, not very reasonable at all.[4]

Indeed, because there is no global budget to limit the costs of the American healthcare system, U.S. physicians have been operating under the technological imperative, or the blind belief in the effectiveness of new technological treatments over older ones throughout history. Thus, U.S. physicians
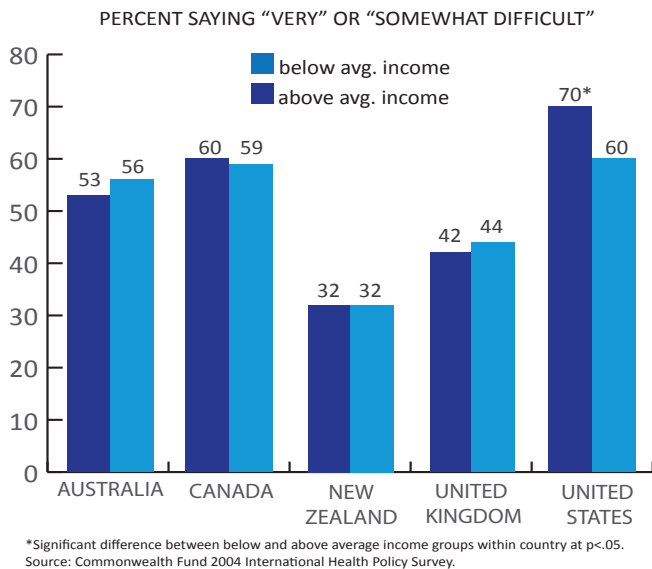
Figure 1: U.S. patients have more difficulty accessing care without going to the ER after normal workday hours than patients in other countries

*Significant difference between below and above average income groups within country at p<.05.
Source: Commonwealth Fund 2004 International Health Policy Survey.

often over utilize resources, unquestioningly give high-tech treatments technological benefit of the doubt and ignore the law of diminishing marginal returns. Blinded by gizmo idolatry, U.S. physicians forget to focus primarily on their patients' wellbeing. The U.S. physicians instead allow erroneous beliefs about expensive, high-tech treatments to cloud their judgment and shift their attention away from their patients as they concentrate single-mindedly upon ordering the technologically most up-to-date, rather than comparatively most effective, treatment.

Along with blind faith in newer technology, the shift in primary care over time is another issue that plays a major role in hiking up healthcare costs and ultimately preventing a patient-centric healthcare delivery system. Primary care is the medical care provided by general physicians like family doctors or pediatricians in local clinics and doctor's offices.[5] Because the primary care physician is the first point of contact for a patient, and because the primary care physician is a constant presence throughout the patient's medical visit, the primary care physician is able to form a lasting relationship with the patient as the physician coordinates the care of a patient and decides the ensuing plan of action for treatment or referrals.[6]

Such a long-term relationship, based on trust and respect, is priceless. In 1982, 1/3 of all medical students in the U.S. opted for primary care. By 1992,

a little less than 20% of all medical students chose to enter primary care.[4] Despite a slight renewal of interest in primary care in the mid-1990s, the rate of students selecting careers in primary care steadily dropped from 1998 onwards. Fewer and fewer medical school students have graduated in primary care since 1998.[7] The shortage of primary care physicians has a crucial impact upon the rising healthcare costs, because patients who have a hard time getting access to primary care will have to resort to the more expensive emergency care, as shown in Figure 2.

Observing just the primary care specialty of family medicine alone, the same decreasing and by 2013, only 10% of all U.S. medical students enter family medicine.[8] Such a drastic change becomes even more evident when considering the ever-shrinking percentage of slots in family medicine residency programs that are filled by U.S. medical school graduates over time. Indeed, as the number of U.S. seniors rise, the fill rate, or the rate of slots in family medicine filled by entering U.S. physicians, continues to steadily decrease; as observed in Figure 2, the fill rate in 2012 was 49.2%, while the fill rate in 2013 decreased by 3.4% to 44.9%.

As a percentage of the overall medical profession, the number of primary care physicians has fallen steadily over time.[9] From 1950 to 1960, there were around 145 physicians per every 100,000 people, and 50% of those 145 physicians were in primary care, thus amounting to about 80 primary care physicians and 65 specialists (Barr 81). In 1970, there were around 160 physicians per 100,000 people, but only 37% of the 160 physicians were in primary care, thus amounting to about 88 primary care physicians and 206 specialists (Barr 81). The number of specialists not only increased but also tripled in size in the same amount of time. Such a disproportionate rate of growth causes reasonable concern about whether the growth rate of the primary care physicians can support the influx of patients needing primary care as the PPACA brings about changes like increased coverage for the uninsured.

How Two Causes of Rising Healthcare Costs Are Due to Lack of a Patient-Focused System

The costs of health care have been on the rise for

Primary Care Positions Offered and Filled by U.S. Medical Graduate Students
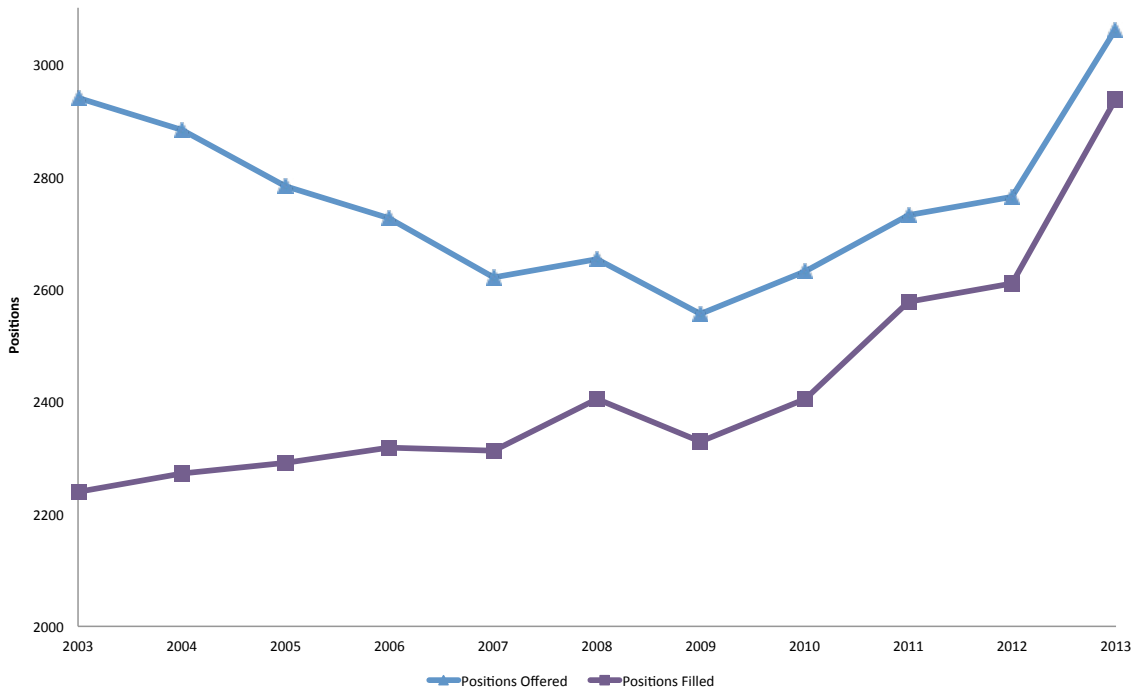
Figure 2: Positions of primary care offered and filled by U.S. medical graduate students over time

over decades, as shown in Figure 3. In 1987, national spending on healthcare amounted to less than 11.0% of GDP. In 1997, healthcare costs had risen to just about less than 14% of GDP. By 2010, national spending on healthcare amounted to about 17.6% of GDP, which is significantly more than the spending of any other country on healthcare. By 2022, costs are expected to climb to 19.9% of GDP, about 1/5 of total GDP, if current situational factors remain constant[10].

In fact, by 2010, the medical portion of consumer price index (CPI) became eight times its former rate from 1976, and quality of care has reasonably not expanded at the same rate.[11] A possible explanation is that patients are just paying more for the care they are given.

So, why exactly are health care costs increasing? The absence of a patient-focused healthcare delivery system gives rise to two issues: one, a society driven more by technological imperative than by patient wellbeing, and two, a primary care doctor shortage in the U.S. that results in limited patient access to physicians and thus limited preventative care for patients.

First of all, the lack of a patient-centric healthcare delivery system paves the way for a society and healthcare delivery system fixated more upon new technology, despite limited and sometimes even controversial supporting research and findings, than

patient health. Newer technological solutions are more often than not regarded as the best method of care in the U.S. health care system .[12] This somewhat irrational yet common belief operates under the technological imperative, which is a prevalent belief that newer technology will always present a better treatment. The technological imperative is ingrained in the U.S. society, as observed from the patient who feels upset over not receiving the most complete treatment consisting of as extensive and technologically up-to-date a range of tests as possible to the physician who orders as many treatments as he or

Figure 3: National health expenditures as percentage of GDP for United States over time

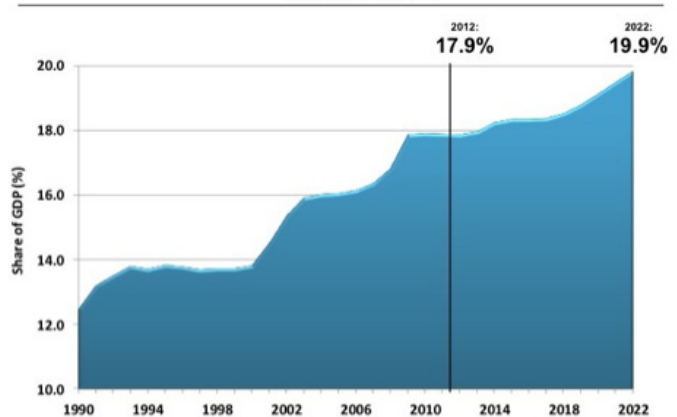she feels will complete a patient's treatment, regardless of comparative effectiveness or cost effectiveness.[4] Indeed, some doctors actually choose to use treatments that are more costly and relatively less effective, just because of the technological benefit.[13] As such, society allows a technological benefit of the doubt, unconsciously expecting that a treatment with a newer, high-tech solution is inevitably better than any older treatment with a low-tech solution.

One example of the hold the technological imperative has on society is the treatment of high blood pressure. Several types of medicines are available to treat such a condition: diuretics, an older treatment from the 1950s, cost only about $25 a year, beta-blockers, created in the 1960s, cost about $150, ACE inhibitors in the 1980s cost $250, and calcium-channel blockers in the 1980s-1990s cost $500 (Barr 58-59). With each progressive treatment, the costs clearly inflate rapidly as newer technological is more costly as well. Without questioning the comparative effectiveness of each treatment, physicians commonly prescribed the most expensive treatment, the calcium-channel blockers, just because they regarded the new technology as the more effective one. However, a research study in 2002 proved otherwise, indicating that of all the treatments, the most low-tech and cheap treatment, diuretics, was best at controlling high blood pressure.[14]

One interesting statistic to note is that even several years after the research study, there is still very minimal change observed in the percentage of patients given diuretic pills. In fact, by 2008, only 5% more of patients experiencing hypertension received diuretic medication over the new options like ACE inhibitors. The 5% was just a slight increase, rising from 30-35% to 40% of patients receiving diuretic medication after the study results were published.[15] Such a slight statistical change is extremely important to note because the diuretic pills have been already proven to be better at controlling high blood pressure, and therefore are acknowledged to be the best treatment option for patients.16 Hence, a physician with the patient's best interests at heart would ideally ignore the technological imperative and choose diuretics over the other treatment methods available.

However, that is clearly not the case, as seen from the incremental change in response to the study. Meanwhile, switching from the high-tech treatments to diuretic pills would save somewhere from $250 to $650 per patient per year, thus helping to combat the rising costs of healthcare.[16]

Meanwhile, the scandal with the arthritis drug Vioxx clearly illustrates another example of gizmo idolatry. Indeed, the drug was found to be actually dangerous to patients, possibly doubling risk of heart attack or stroke for patients who take it longer than 18 months.[17] Blinded by gizmo idolatry, the majority of physicians and patients remained unaware and continued using Vioxx until Merck & Co., which had drowned all rumors of risk through intense baby-boomer-targeted ad campaigns featuring music by the Rascals, publicly renounced its drug for possible triggering an estimated 30,000 to 100,000 heart attacks.[17] If the information had been more accessible to patients and physicians, many lives could have been spared, along with healthcare expenditures.

A second major factor impacting the patient-centric healthcare delivery system is the shortage of primary care doctors. The primary care shortage is due to various reasons, the main three being lack of a challenge, lack of a comparatively high salary, and greater prestige in specialization. Specifically, primary care is not as popular because it becomes bland after awhile due to the repetitiveness of the job. Also, compared to the salaries of specialists, primary care physicians are also not paid very well. Thus money lures away from primary care, especially since finances are very prominent concerns for graduating medical students with giantloans.[18] The starting salary of a specialist is therefore very tempting, because it pays well above the $300,000 income level for most specializations and even averages just below $500,000 for orthopedic surgeons, as seen in Figure 4. Finally, there is much greater fame and respect associated with specialists, because of the amount of training involved to achieve such specialization and because of the technology that the specialist must handle.

Currently, 30% physicians in the U.S. are in primary care. As of 2013, according to the Association of American Medical Colleges, around 20% of medical residents enter primary care.[19] Unfortunately, with the ever-growing population, the US will have

a shortage of about 45,000 primary-care physicians total for all three primary care specialties of internal medicine, family medicine and pediatrics.[20]

Greater numbers of primary care physicians and an overall stronger network of primary care doctors can help reduce excessive healthcare costs. A recent study by Johns Hopkins researchers found that
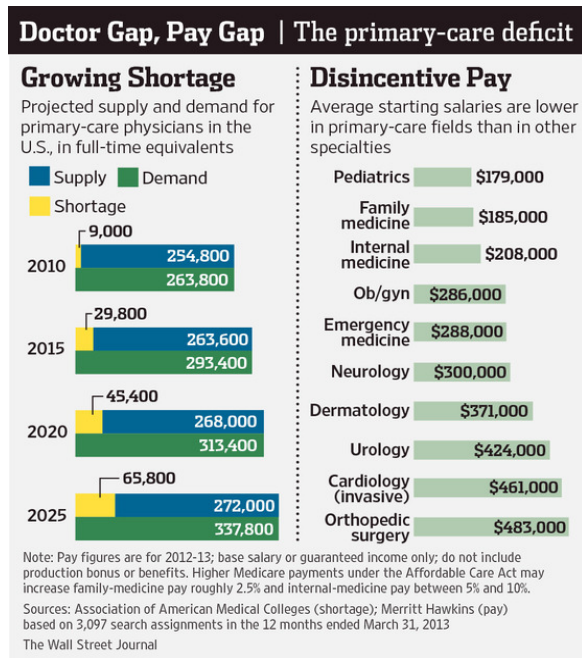
Figure 4: Primary care shortage as explained by salary disparities

system and the resulting rising costs of healthcare by individually addressing the two root problems of blind abuse of technology and primary care shortage. In order to create a more patient-focused healthcare delivery system and prevent costs from rising, the PPACA first attempts to resolve the problem of gizmo idolatry, and then tackles the primary
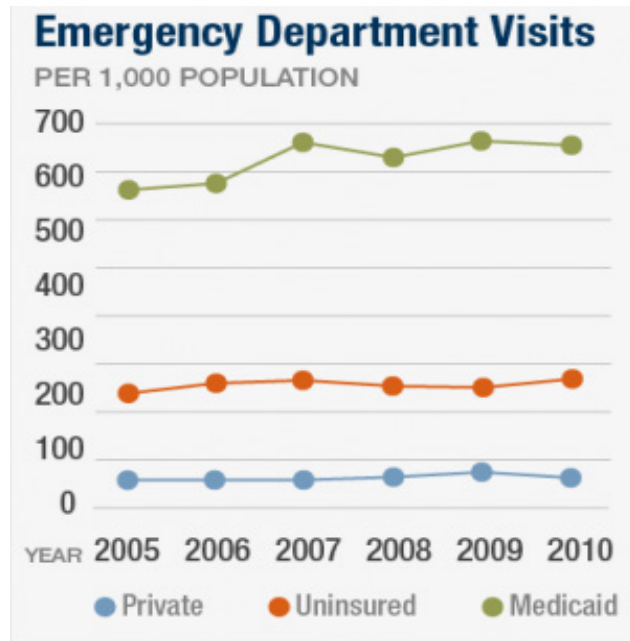
Figure 5: The increasing number of emergency department visits between 2005 and 2010

each 1% increase in the proportion of primary-care physicians was relative to 503 fewer hospital admissions, almost 3,000 fewer emergency-room visits, and 512 fewer surgeries annually in a typical city.[20] Basically, the increase in primary-care physicians allows an increase in preventative care, thereby evading the emergency rooms, hospital admissions, and surgeries.[21] Since the rate of emergencies should stay constant, the increase in the number of ER visits is probably due to other factors than just more emergencies; primary care shortage and inability of the patient to access primary care when in need is therefore a very feasible cause of the jump in the number of Medicaid patient ER visits from just below 600 per 1000 people in 2005 to more than 650 per 1000 people in 2005, as seen in Figure 5.

The PPACA Addresses the Lack of a Patient-Centric Delivery System

The PPACA addresses the lack of a patient-centric

care shortage by encouraging primary care growth and improving the organization of health care delivery to maximize utilization of primary care doctors.

Firstly, in order to address the blind use of technology and bring the main focus of the physician back to the patient, the ACA will improve healthcare quality by expanding comparative effectiveness research (CER).[4] CER will then compare costs and effectiveness of alternative methods of diagnosing and treating patients.[22] As such, CER will provide greater awareness of the effectiveness of a treatment and therefore hopefully discourage the blind use of technology due to gizmo idolatry and encourage research-backed choices made by informed patients and physicians.

One direct way through which the PPACA will expand CER is by establishing a national Patient-Centered Outcomes Research Institute (PCORI). The current most commonly used source of information for choosing prescription drugs is called the *Physi-*

cians' Desk Reference, which provides somewhat obscure information about active ingredients and side effects rather than useful comparative effectiveness. As such, doctors and patients have no way of understanding how to compare and identify the best treatments. Thus, PCORI, a nonprofit and independent organization, will carry out research studies that compare the alternative approaches to diagnosis or treatments. Then, it will create a national database about the comparative effectiveness data in order to increase access for both patients and physicians to such knowledge.

However, the PPACA does not allow the use of CER results to be considered as cost-effectiveness research.[4] The PPACA will therefore recommend certain optimal care approaches, based on CER results, but ultimately will have the goal to just provide information about effectiveness of treatments and diagnoses rather than mandate specific procedures.

Secondly, in order to address the primary care shortage and hopefully revert the trend of preventative care, the PPACA will first encourage primary care growth and then improve usage of primary care doctors. To encourage primary care growth, the PPACA will enact three shifts in policy.

Primarily, it will increase federal funding for primary care training in graduate medical education by taking away funds from specialist training programs and adding them to primary care training programs. It seeks to create new types of primary care training programs based in community settings rather than traditional hospital setting.[18] These programs, called teaching health centers, would be the results of partnerships between medical colleges and nonprofit community clinics. More than 90% of medical training in the U.S. occurs in academic medical centers like medical colleges and universities.[20] To encourage medical students to pursue primary care, PPACA will shift training out into the community, encouraging students to serve in rural areas as a form of public service.

In addition, the PPACA will increase the monetary incentive to pursue primary care by increasing payment for primary care services. Primary care physicians treating Medicare patients will receive a 10% bonus

in payment under PPACA policy change, while those treating Medicaid will get the same rates as well.[4] Furthermore, the PPACA will increase funding for National Health Services corps to repay educational loans of primary care physicians who practice in shortage areas like rural communities or inner cities.[4]

Furthermore, the PPACA will increase support for a new organization of primary care, called the patient-centered medical home (PCMH). The PCMH will also focus on creating a trust-based relationship between patient and physician over time, but also reorganize the practice into one built on teamwork, integration, coordination, and comprehensive care.[24] Ultimately, the PCMH will depend on a team of providers of primary care physicians, allied professionals, and support personnel to assure quality and accessible care.[4] The PCMH will focus on good communication skills and teamwork among the team members, thus assuring higher quality of care for each patient and better integration and coordination of care overall, as seen in Figure 6. Because everyone in the team feels a sense of responsibility to the patient and forms a connection with the patient, the team as a whole will strive to ensure quality and accessible care.[4] The PPACA also strives to develop better models of PCMH, rewarding the best models with reimbursements for care. Through PCMHs, the PPACA hopes to expand access to quality primary care throughout country. The expansion of primary care will therefore simultaneously increase access to preventative care, due to greater access to primary care physicians.[25] Therefore, by presenting a solution to primary care shortage, the PPACA can lower excess healthcare costs caused by lack of access to preventative care, like cutting down on unnecessary emergency room visits.

Analysis of Positive Changes Enacted by the PPACA as Merely Temporary Solutions

PCORI and PCMH are positive changes under the PPACA, but not final solutions. PCORI is limited in that it can only compare treatments without considering cost due to ethical issues of cost-effectiveness research.[26] Therefore, the probability of dampening healthcare costs through CER and PCORI becomes less likely. Also, PCORI can only be used as a recommendation of optimal care; unfortunately, as seen

from the example mentioned previously in this paper about the usage of diuretics, physicians who are already accustomed to partaking in gizmo idolatry will persist in their assignations of newer high-tech treatments over more effective low-tech ones. PCORI is also constrained by the societal stigma against low-tech solutions; despite data from its research studies, PCORI will have a difficult time persuading patients that the best care is no longer the most high tech care.

PCMH is further limited in that the initial cost of starting a PCMH is extremely daunting to the medical team.[27] Therefore, not many places are willing to create PCMHs. A key strength of the PCMH undoubtedly is the innovative usage of the primary care physician with a supporting team in order to provide a better quality of care for the patient. However, unless the entire healthcare system accepts and works to implement PCMHs, the PCMH can only be a temporary solution because of the risks involved and the wariness of the participating medical staff and institutions to assume the high fees associated with creating a PCMH.

Predicting Future Outcomes of Health Care from Policy Shifts under PPACA

Though the changes enacted by the PPACA will not be final solutions, in the near future, the shift of focus back onto patients in a patient-centric delivery system will create significant changes to health care in the future. The PPACA will increase access to primary care by focusing on resolving the shortage of primary care by encouraging primary care growth and instituting new organizations of primary care. In addition, it will increase access to information about diagnoses and treatments, and thereby increase quality of healthcare by ensuring that patients and

physicians are well informed about their decisions when choosing methods to approach treatments and diagnoses. By doing so, the PPACA will hopefully overcome the hold of the technological imperative on the U.S. physicians and patients. However, it will not be able to completely change the stigma against low-tech solutions, as it can only offer a recommendation instead of mandating a procedural change. The PPACA's policy changes will also improve rates of preventative care and cut down on unnecessary healthcare costs racked up from stays in the emergency room and ambulance usage. However, because the fundamental causes behind the rising health care costs are not limited to the issues covered in this paper, the PPACA's solutions will only help constrain cost growth for a while. Then, the costs of healthcare will ultimately start to rise again in the future.

Consequently, the ACA will address the lack of a patient-centric system by attempting to resolve some of the fundamental problems of the system. By seeking to create a more patient-focused healthcare delivery system, the ACA will thereby improve health care quality, access, and cost, at least in the short-term. In 2006, the American health system ranked extremely poorly across the board for quality, access, efficiency, and equity. More specifically, the U.S. scored 66 out of a possible 100, leaving many areas in which to improve performance-wise, improvements that could actually amount to saving between 100,000 and 150,000 lives and $50 to $100 billion a year.[28] With the changes proposed by the PPACA to bring the focus of the delivery system back to patients, specifically by addressing the two root issues mentioned, the U.S. healthcare system can show improvement in quality, access, and efficiency and temporarily decrease or at least stagnate the rate of rising healthcare costs.
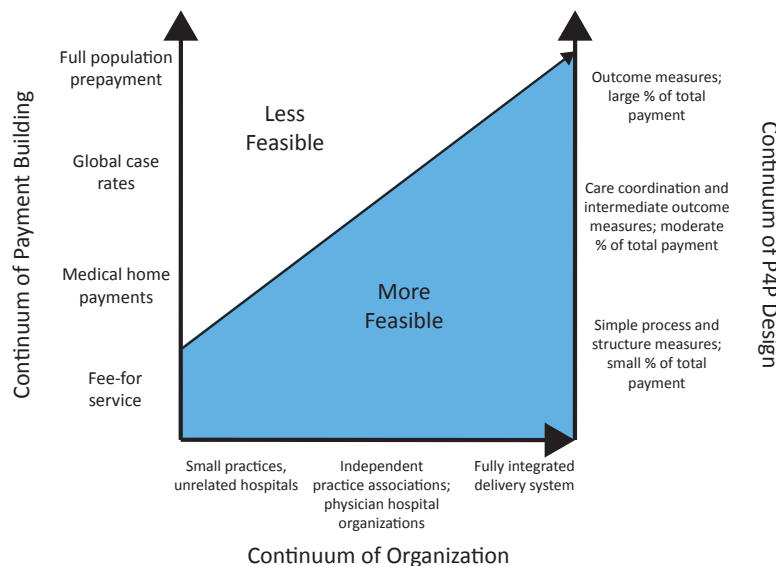

Figure 6: The expected feasibility of the PCMH, among other integrative changes under the ACA

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The New Dilemma: "Le Futur" of Straining Social Safety Nets Everywhere, Lessons from France to the USA

Ceslee D. Montgomery

One of the principle aims of the Affordable Care Act (ACA), passed in March 2010, was the enfranchisement of over 27 million uninsured. Thereby, through individual subsidies and the expansion of Medicaid, bolstering America's "safety net." By contrast, in much of Europe and the developed world, policy aimed at the universalization of healthcare coverage began to be adopted following World War II. Specifically in France more than a half-century ago, General Charles de Gaulle decreed by an order the creation of a system for sickness, maternity, injury, aging, and death. By 1999, with the creation of "Couverture maladie universelle", France had achieved near universal healthcare within two generations. This provision intended that in France, one's financial condition would not unfairly burden them with the additional financial consequences of "social risks."

Over 50 years later, it has become clear that the "social safety net" is inextricably linked to the both the wealth and development of a nation. While the publicly administered healthcare system in France is beloved by most of the French, the expensive system's contribution to the public debt is raising questions about the sustainability of such a system during a time in which economic woes may persist. As America expands its safety net through the ACA, the message of France, and much of Europe is clear: while the state may promise to promote social welfare, it is the strength of the economy which insures the continued provision of the social benefits we promise.

Although the cost of healthcare in France is roughly half as costly as ours, because their system is largely publically financed, it continues to contribute to the growth of the national deficit. In 2010, the US spent $8,233 per capita on healthcare expenditures, while France spent $3,997, according to the WHO.[1] Thus conversations of excessive cost usually center on the United States. So why does France have an unsustainable healthcare problem? In 2011, the public funded 76.8% of health spending in France, more than the OECD average of 72.2%.[2] The enormous fiscal burden of a welfare state has driven up French debt to 93.7% of GDP compared to 81.8% GDP in 2011. The Economic and Monetary Union (EMU) of the European Union (EU) sets the threshold for national public debt at no more than 60% debt to GDP.[3] Because France is on track to miss the upcoming 2014-deficit reduction deadline, many have shifted from discussing the unsustainability of public debt today, and now consider the future trend equally troubling.

Two trends dominate public discourse on the future of social safety nets everywhere: the concomitant projections of stagnant economic recovery vis-à-vis slowed job creation, innovation, and economic growth and projections of an increase in healthcare consumption due to such global demographic trends as increased life expectancy and incidences of chronic disease. Thus, as the US expands its social safety net, we may be forced to one day consider the question France is facing: how do you resolve the tension between public support for a generous social safety net and the economic feasibility of sustaining one? This question is not new to France. Jean-Marie Fessler, Hospital Director and Counselor to the President of the Mutuelle Générale de l'Education Nationale (MGEN) in France, illustrates well the deeply human dilemma faced by the French: "In addition to the costs, prices, deals, budgets, salaries in medicine, are the result of multiple pressures and trade-offs: are images of the body expensive? 1000 euros, 3000 euros ... This is the price of what? Of life?"[4] Following the oil crisis of 1974, economic growth slowed and unemployment spread. Then, it became difficult to sustain the weight of a healthcare system that was financed primarily through wages.[5] Thus, it simply is a system that is unsustainable without the health of the French labor force. Economic growth, arguably the measure of economic recovery potential, progressed 0.2% in 2012, against a three-year average of 1.2%.[6] Combined with a French govern-

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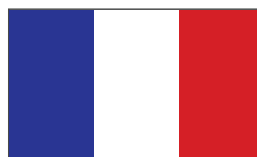
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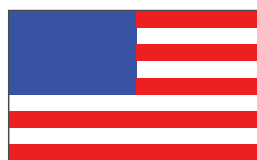
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ment projection of a .5 to 2.5% GDP rise in health-care spending contributed by aging by 2050, slow economic recovery and an increase in demand for care are strong signs that France will continue to be overextended by the cost of its social welfare system. Consequently, the French government is targeting 15 billion euros of savings in the 2014 budget, weighted towards ministry expenses and healthcare spending.[7] Cost-containment became a primary objective beginning with the oil crisis of 1974. France has continually regarded budget cuts to reign in public spending. If France faces several years or more before it achieves a balanced budget, one would expect the continued existence of budget cuts. To the citizenship, this equals seeing the "generosity" of their "prestations" or benefits decrease.

Healthcare spending on Medicare and Medicaid by themselves (1.8% and 3.2% of GDP respectively in 2011) undoubtedly take up a sizeable portion of the US federal budget. In this same year, the US federal government's budget deficit was $1.3 trillion, at 8.7% gross domestic product (GDP). The social safety net is may be considered conservative, insomuch as it aims just to cover older Americans and the poor and to promote the affordability of care for everyone else. But even this relatively conservative safety net at a combined 5.0% GDP in 2011 features significantly in the federal budget. With spending just on Medicare and Medicaid budgets equivalent to a little more than half of the federal deficit, American policymakers like their French counterparts view healthcare spending as dangerous for the federal debt. Importantly however, because the federal deficit is an imbalance resulting from excess spending/insufficient revenues, federal aims at shedding debt and sustaining federal programs for the future are beholden not only to cost

containment of expenditures but the growth of the economy itself, which increases tax and other revenue to the state. Coming in at a 1.2% average over the past three years, this "competitiveness," according to Fessler[8], is exactly what is most is limiting the future of sustaining France's healthcare system.

France is presently deep in an alarming sinkhole of dangerously high national debt, struggling to maintain its promise of provision of resources to counter "social risk" any one person may face. By contrast in the US, rising national debt concerns public leadership with less immediacy than the "austerity measures" pursued in France and triggered by the economic recession of 2008. While the US may not see extreme corrective economic policies for years to come, it is worth noting that with the "promise" of the expansion of the social safety net is inked the obligation of that society into the future to maintain solvency for the corresponding fund that brings to fruition that same promise. The challenge of this promise is not new to the US. Medicare trustees state that even after the positive cost controls of the healthcare law extended the life of the fund two years, Medicare will be insolvent after 2026.[9] Let the tension in France between its generous social safety net, the envy of the world, and its fiscal risk serve as a lesson to the US: delivering on this promise is not yet, and for years to come will not be, old.

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INVESTIGATION

The investigation section presents and analyzes pressing public health issues through the lens of epidemiological, medical, and scientific perspectives.

Calculating Compassion

Jessie Holtzman

*W*hy do people in positions of power choose not to utilize their influence to benefit others? Why do others act without regard to their own benefit in order to assist strangers? These are questions that the Stanford University Center for Compassion and Altruism Research and Education currently investigates under the leadership of Dr. James R. Doty. For centuries, Buddhists have investigated the righteous path of compassion through introspection and spirituality. Now scientists have joined the search for a systematic means to understand and achieve compassion and its motivations.

The Roots of Compassion

During a revolutionary visit from the Dalai Lama to Stanford University in 2005, the Dalai Lama met with scientists in fields including psychology and neuroscience, as well as other Buddhist contemplatives in order to discuss compassion, suffering, and addiction. Following these discussions, Dr. James R. Doty compiled a team to conceptualize an institute that would collaborate with the Buddhist community to research compassion. Unlike scientists, Buddhist practitioners have documented compassion for years through observation and meditation.[1] Dr. Gary K Steinberg, the Director of the Stanford Institute for Neuro-Innovation and Translational Neurosciences and an avid supporter of CCARE, stated, "What is of real interest to me and the people involved in CCARE is how do we understand [compassion] in terms of how the brain works, circuits particularly, and is there a way that we can develop compassion in people who don't display it, without spending 20 years meditating as a monk."

Science and Buddhism?

Though historically religion and science have been seen as antithetical to one another, Buddhism and scientific research share the quality of empirical analysis. Both involve objective observation of facts, and the consequent interpretation and application of these facts to existing beliefs. If a new observation contradicts established practices, both Buddhists and scientists will review their beliefs in an attempt to incorporate the new knowledge.[2] In fact, according to Dr. Steinberg, "One of the Dalai Lama's main motivations entering in this project [is that] he would like to develop compassion in young people using methods that don't include years of rigorous meditation," demonstrating a desire to both secularize and universalize the practice of compassion.

His Holiness the Dalai Lama commented, "I truly believe compassion provides the basis of human survival, the real value of life, without that there is a basic piece missing. We cannot be happy ourselves without thinking about the happiness of others."[3] As suggested by the Dalai Lama, altruism is key to human interaction, development, survival, and perhaps even evolution. Accordingly, compassion is not seen as a uniquely human quality. Numerous studies have described the altruistic tendencies of chimpanzees and other higher primates, suggesting an evolutionary advantage of compassion to enhance the proliferation of a specific genetic pool.[4]

Quantifying Compassion

CCARE faced significant opposition initially from scientists who questioned the ability to quantify a seemingly subjective sentiment to scientific standards. As a part of the Stanford Institute for Neuro-Innovation and Translational Neurosciences, CCARE was challenged because it did not use the traditional techniques of molecular biology or synaptic physiology, and did not target a specific disorder of the nervous system, as is common within this field.[5] However, Dr. Steinberg stated that "the idea of CCARE is to study in a rigorous scientific manner the neural and psychological basis of compassion and altruism, so this puts [the study] in a different sphere than simply studying the spiritual or religious basis." Defending the quantification of compassion, he explained, "A lot of research can fall into a fuzzy, vague, non-scientific category. That may be fine, that may

Dr. James Doty and His Holiness, the Dalai Lama, at Stanford University in 2005

be important, but simply saying we want to be more compassionate is not what we're trying to do."

To validate the research of compassion in the context of neuroscience, CCARE delineated a rigorous definition to allow the quantification and objective study of compassion. "The idea is to have an objective outcome, a metric, that you can say 'yes.' That person has developed more compassionate behavior," said Dr. Steinberg. The definition encompasses four qualities: identification with another person, feeling his suffering, wishing that he be free of this suffering, and acting to diminish or extinguish suffering. A second, more advanced level of compassion involves extending compassion to an individual with whom one experiences conflict or antipathy.

But a clear definition is not enough to understand the neurological implications of compassion. CCARE predominantly utilizes functional magnetic resonance (fMRI) imaging to localize areas of activity during compassionate acts. But researchers acknowledge that it remains difficult to induce compassionate behavior in a laboratory setting.

In a quintessential study of the neuroanatomy of compassion, subjects were asked to look at a series of images of faces and to either extend compassion or neutrality toward the image. If compassionate feelings were generated, the researchers predicted that there would be activity in the parts of the brain that involve anticipation of suffering, as well as the expectation of reward or benefit. Researchers hypothesize that the latter brain activation relates to a desire to reduce the suffering of the faces in the images.[6]

The second task involved the same subjects in a situation where they were not aware that compassion was being elicited. The subjects were shown a piece of abstract art and asked how they felt after seeing the piece. However, the same images of faces were flashed for 33 milliseconds before each piece of art and then covered by the visual mask of the art. The researchers noted similar compassionate sentiments and the subjects claimed that they felt better after seeing the pieces following the faces to which they extended compassion. Through these tasks, researchers began to identify areas of brain activity related to compassionate acts.

Training the Mind

The scientists at CCARE believe that compassion may be a trainable skill with the help of developing technology that allows for the neurological study of the sentiment. At the "Scientific Explorations of Compassion and Altruism" conference sponsored by CCARE, Dr. Steinberg compared the potential for training the mind to that of the physical training of Olympic athletes. He explained that over the past 100 years, scientific research has discovered new methods of training, leading to exponential increase in the potential of athletes. By analogy, through mental training and the development of systematic forms of deliberate practice, scientists hope to maximize the potential of the human mind for clarity, compassion, and wisdom.

CCARE hopes to secularize the practice of compassion, as Dr. Steinberg stated, "if we can figure out how to activate compassion and what kind of behaviors or exercises could develop it, there are really widespread implications for society as a whole." Looking forward, CCARE anticipates comparing Buddhist adepts with more than 10,000 hours of compassion meditation training to novices so as to understand how the release of the neuromodulator dopamine and the action in the reward processing areas of the brain relate to compassionate behavior. The study of altruistic behavior has come far over the past few years and "undoubtedly, within the decade or two decades, the discoveries in neuroscience will profoundly affect societal values. So I think that the ability to understand and promote compassion is also very important."

Dr. Gary K Steinberg is the Bernard and Ronni Lacroute-William Randolph Hearst Professor in Neurosurgery and Neurosciences at Stanford University. His clinical research focuses on elucidating the pathophysiology of acute cerebral ischemia and in developing neuroprotective treatments, as well as methods to restore neurologic function after stroke. Dr. Steinberg has also been a member of the Executive Committee of the Neuroscience Institute and of the Center for Compassion and Altruism Research and Education at Stanford since their inceptions. He is currently the director for the Stanford Institute for Neuro-Innovation and Translational Neurosciences.

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Early Puberty and its Detrimental Consequences

Niharika Bedekar

In recent years, the rapidly decreasing age of puberty in girls has garnered widespread attention. In the 1980s, the conventional wisdom of the time was that the majority of girls began puberty at the age of 11. Now, however, the average age of breast budding has decreased to 9.26, a significant decrease considering only 20 years have elapsed.[1] The cause of this trend remains unclear, though recent studies have shown that girls who have a higher BMI tend to develop earlier. This decrease in the age of puberty has manifested itself as a health concern because studies show that girls who go though puberty earlier are at a higher risk for breast and uterine cancer, as well as a variety of other psychosocial disorders. Currently, numerous studies are being done to pinpoint the causes of early puberty.

The onset of puberty is signaled by the production of hormones by the ovaries and testes, which is stimulated by the release of hormones by the pituitary gland in the brain. Most children who undergo puberty early have no underlying biological abnormalities. However, some girls with serious biological problems such as brain and ovarian tumors, injury or radiation to the spinal cord, or hormonal disorders mature earlier due to the irregular release of hormones by the pituitary gland. These girls, however, are a minority.[2]

Usually, doctors cannot pinpoint the causes of precocious puberty, an uncertainty that causes widespread distress in parents and daughters alike.

Recently, studies have targeted certain risk factors that parents can watch for in their children. Research has proven that children who are obese are at risk for early puberty due to the hormone leptin, which is secreted by fat cells. Puberty only begins once there is a baseline level of leptin in the body, so young girls with excess body fat will reach that target level quicker than their peers.[3]

Environmental factors such as exposure to chemicals can affect the hormonal balances in the body, and may be another cause of early puberty. As Dr. Nancy Brown, a Health Educator at the Palo Alto Medical Foundation explains, "encouraging families to remove toxins from their environment is a start, but really difficult. For example, cotton uses more pesticides and insecticides than any other crop, so what's a girl to do?" These chemicals are present in a multitude of every day materials, such as shower curtains, shampoos, cash register receipts, nail polish, nonstick cooking spray, and plastics. These chemicals are estrogen mimics, and behave like steroid hormones, thus speeding up puberty. Children are exposed to these chemicals before they are even out of the womb: a study commissioned by the Environmental Working Group found that 90% of newborns had BPA in their umbilical cords.[4]

Early puberty also stunts growth. Girls who develop early will not reach their target heights and will be

Onset of Puberty by Age

Legend: Breast development, Pubic hair development

Data by age (years): Breast development / Pubic hair development
- 7: 9% / 10%
- 8: 16% / 17%
- 9: 42% / 32%
- 10: 75% / 57%
- 11: 91% / 86%
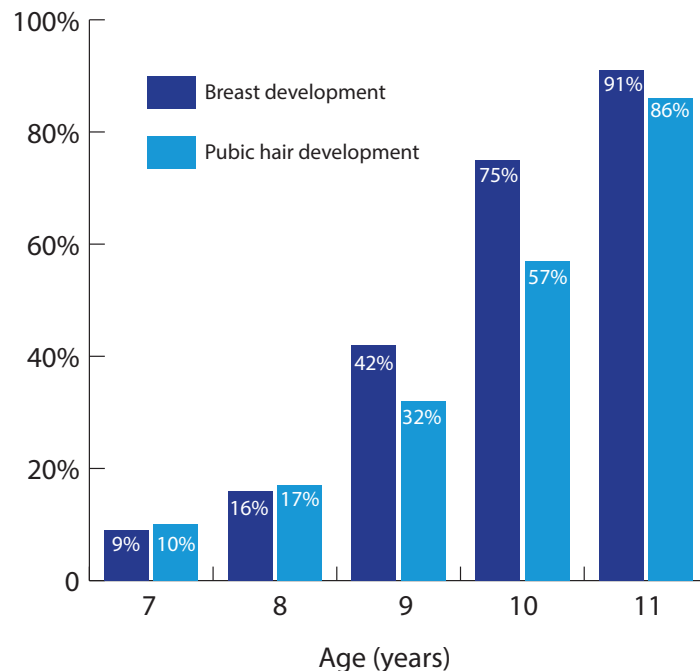
Notes: Based on data for 444 healthy girls. Puberty defined as Tanner stage II or greater.
Source: Dr. Greenspan // Produced by Elseier Global Medical News

shorter than their peers. Since their bones develop faster, these girls will be taller than their peers at the beginning of their maturation. Unfortunately, this rapid growth soon ends, and affected girls will ultimately be shorter than their target height. Children who develop at a very young age may be administered medication to halt the progress of maturation.

In recent years, early puberty has become a public health issue due to the multitudes of disorders it can cause later in life. Precocious maturation is correlated with a high risk of breast cancer and ovarian cancer. Girls who undergo puberty earlier are exposed to estrogen for longer, and elevated estrogen is linked to breast cancer.[5] In addition, these girls are also prone to becoming insulin resistant diabetics. In addition to the physical harms, affected girls are also at risk for a multitude of psychosocial disorders. Early maturing girls have higher rates of depression and lower self esteem than their peers. Many are uncomfortable with their developing bodies, and try to hide the changes from everyone in their lives, including their parents. Additionally, girls feel pressured by outside scrutiny about their bodies. As Dr. Brown discusses, "the toughest impact to mitigate is the sexual attention young developing girls get from older men." The mature physical appearance of young girls may cause them to receive unwanted attention from older boys and men. This pressure may cause them to later engage in high-risk behaviors such as drug and alcohol use.[6] Since puberty is a time characterized by rapid cognitive and emotional maturity, is it important for this transition to be as smooth as possible to ensure mental health.

When faced with the dilemma of having a child going through puberty early, many parents often become more distressed than their children. However, Dr. Brown believes that "there does not need to be any trauma associated with early puberty, because the impact can be mitigated with education, good communication, and school and family support." School and home environments play an important role in ensuring a child's mental stability. Schools can "clamp down on bullying and teasing," and parents can nurturing and provide an environment in which puberty is discussed openly and feels normalized.[6]

However, not all parents approach the onset of puberty in a positive way. Some parents' immediate action attempts to halt the progression of puberty. This can be done with hormone suppressing drugs that will prevent the release of sex hormones. Another tactic some parents employ is restriction of their child's diet by cutting out fats and oils to try to prevent obesity. Though healthy eating is an important practice, it is futile in preventing puberty, as losing weight will not stop maturation.[2]

Researchers are currently trying to determine the environmental trends and biological causes of early puberty. They are concentrating their research on whether environmental pollutants or drugs may be altering endocrine systems. However, until research emerges about the definitive causes of early puberty, the roots of precocious maturation will continue to be shrouded. It is important to be cognizant about the risks of early puberty, as there are many detrimental consequences that can alter a girl's physical and emotional state forever and to understand the ways in which these negative consequences can be mitigated until research provides more answers.

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PRACTICE

The practice section centers on the implementation of public health initiatives on the ground, which are the culmination of research questions and policy decisions.

Complex Problems, Simple Solutions

Lara Mitra

"All effective innovations are breathtakingly simple. Indeed, the greatest praise an innovation can receive is for people to say, 'This is obvious. Why didn't I think of it?'"[1]

- Peter Drucker

When Jessie Liu, one of the founders of Care Companion, was asked what advice she would give to students interested in launching health-related innovations, she responded: "listen, observe, test, and repeat."[2] With this four-step procedure, Liu suggests how complex health problems can be broken down into a simple framework. Simplicity in design underlies three promising technological health innovations—Care Companion, Standardized Birth Mat, and LifeStraw—that tackle disparate and complex problems in the developing world.

Care Companion was born in response to the question: "Who cares more about a patient than his or her own family members?" Founded by four Stanford students, Shahed Alam, Katy Ashe, Edith Elliott, and Jessie Liu, and supported by Stanford's Extreme Design for Affordability initiative, Care Companion trains family members of the patient, who might otherwise sit idly in hospital waiting rooms, to nurse.

Members of a Care Companion meeting gather to discuss medical needs in their community

Facing a shortage of 2 million doctors and 2.4 million nurses, India lacks the capacity to provide care to all in need.[3] By training family members to perform the easier, but time-consuming tasks, hospital staff can dedicate attention to skilled care. Post-hospital recovery is assisted as the patient is surrounded by trained "care companions." Care Companion's simple solution harnesses the already available time of family members and their concern for the patient's well-being to simultaneously better utilize the skills of hospital staff.

Jessie is most proud of the enthusiasm shown by patients, family members, and medical personnel in the Narayana hospital in India during the pilot and roll-out. "It was incredible to watch training sessions in which college-educated sons would practice skills side-by-side illiterate farmers' wives, and both would become confident in helping their loved one perform physical therapy exercises, recognize warning signs, or take a pulse," she said.[2] As a next step, further pilot testing will take place in India after which it will be promoted widely. By making use of an enthusiastic and committed source of potential caregivers – patient family members –

Care Companion addresses the shortage of doctors and nurses in India by integrating family members into a patient's treatment and recovery.

Another simple solution to a complex and life-threatening problem is the Standardized Birth Mat invented in Bangladesh. The Mat helps detect, in real time, excessive blood loss at child-birth, signaling to traditional birth attendants the need to obtain immediate emergency care for the mother. Until the Standardized Birth Mat was invented, there was no low-cost and effective method to accurately measure blood loss during births. Maternal death often resulted from a hemorrhage or excessive blood loss. Since a healthy birth in any case involves large amounts of blood loss, hemorrhages are difficult to detect. Visual estimations are frequently inaccurate, as it is difficult to quantify how much blood loss is life-threatening. Existing alternative methods (such

Women using LifeStraw

as direct blood collection and venous blood sampling), and advanced methods (such as red blood cell and plasma volume determinations using radioactive tracer elements) are expensive for most communities, especially in rural areas. Moreover, the high illiteracy rates in developing countries where maternal mortality is a particularly serious problem make these methods, which involve reading measurements, impractical. At a cost of 40 taka or about 50 cents per Mat, the Standardized Birth Mat can help women determine the difference between natural blood loss and hemorrhage after birth. The 50 cm square tissue and cotton Mat is designed to absorb a maximum of 400 milliliters of blood.[4] If the Mat becomes saturated, it indicates that the woman may be suffering from a hemorrhagic blood loss.

Early results are promising with a reduction observed in the number of maternal deaths in populations where the Mat has been used. In an interview of a sample of 3000 users of the Standardized Birth Mat, nearly all said that the Mat had been beneficial and that they would be willing to pay for one during future deliveries. A grant from the Bill and Melinda Gates Foundation is supporting further refinements in the Mat that will help to make

it biodegradable and in turn enable it to be disposed of more easily. The Mat will then not only be a simple and low-cost solution to a life and death problem, but also an environmentally-friendly one.

Another creative solution involves creating water systems to provide clean water. Generally this has been costly and has required electricity, equipment, spare parts, and technical expertise. However, it would take years for such systems to be up and running and consistently function at a high-level. Enter LifeStraw, a personal, low-cost water purification tool with a life time of 700 liters – approximately one year of water consumption for one person, two years for a child. It is a 25 cm long, 29 mm diameter plastic straw with a built-in filter of layers of sediments and costs around $2.00.[5]

This age-old problem of unsanitary drinking water that kills millions each year, was spurred by the question "Would you drink water from a toilet?" More than one billion people – one sixth of the world's population – are without access to safe water supply. Furthermore, at any given moment, about half of the world's poor suffer from waterborne diseases, of which over 6,000 people,

mainly children, die each day.[5] So far, test results have shown that LifeStraw can protect against common waterborne bacteria such as salmonella, shigella, enterococcus and staphylococcus, and has the potential to protect against even more diseases.

A significant shortage of doctors and nurses in India, high maternal mortality rates from home deliveries in Bangladesh, and the lethality of water-borne diseases worldwide all represent complex problems for which simple solutions have been found. These solutions are being further piloted for future replication as in the case of Care Companion, refined in terms of biodegradability as in the case of the Standardized Birth Mat, or already being scaled-up through marketing of the LifeStraw on the internet. Challenges remain, for example, in terms of ensuring that care companions receive quality training, that the Standardized Birth Mat is used properly with the quick transfer of the mother to a hospital when the Mat indicates her life is threatened, and ensuring that poor people can afford the LifeStraw and do not continue to use it beyond its shelf life. Yet there is no denying that these simple solutions to complex problems carry the promise of a better life for all.

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Tweet, Tag, Pin to be Thin

Alaina Butler

Should we censor eating disorder-related content on social media sites?

Follow one hashtag too many, and you may find yourself entangled in the world of "Thinspiration" on social media sites such as Twitter, Facebook, Instagram, Pinterest, and Tumblr. Thinspiration is the euphemistic name for content that promotes restriction of caloric intake and obsessive exercise habits to facilitate rapid weight loss. Young women flood many social media sites with pictures of slender models, unhealthy goal weights, and self-deprecating status updates that sometimes denote thoughts of self-harm or suicide. Many users identify as "pro-ana" (short for pro-anorexia) or "pro-mia" (pro-bulimia) and keep their profiles anonymous to avoid judgment from family and peers.

Social media giants have been grappling with decisions about censorship for years. "We recommend that companies remove content that promotes or glorifies eating disorders and self-harm behaviors," stated Claire Mysko, award-winning author and representative of the National Eating Disorder Association (NEDA). "We also recommend that social media platforms provide support to users who search for this kind of content with a link to the NEDA helpline." In 2011 and 2012, NEDA partnered with Tumblr, a microblogging website, and Facebook, the owner of the photo-sharing platform, Instagram, to help flag and remove "content that could trigger those susceptible to an eating disorder or further entrench the illness for those struggling."[1] This action was taken after increasing concern that thinspiration content on these sites was fuel to the eating disorder fire.

Efforts to curb this trend have been somewhat unsuccessful, because censorship of these blogs is much like a high-tech wild goose chase. Blocked users can simply open new accounts, innovate around flagged hashtags, or move to different websites completely to avoid censorship. Thinspiration bloggers are particularly resistant to censorship because of the value they see in thinspiration communities.

Daphna Yeshua-Katz and Nicole Martins, researchers at Indiana University, interviewed 33 female bloggers ages 15 to 33 to learn more about the value of pro-ana blogs for those involved. The young women all agreed that the blogs provided a space for much-needed self-expression, emotional release, and social support free from stigma, though they did concede that the blogs may encourage eating disorders.[2] Interviewees suggested that the blogs are more about finding an understanding community and coping with a disease than glorifying eating disorders. Bloggers emphasized the importance of knowing that others share their feelings. They also described the catharsis derived from transforming their problems into words on a page. "It can help me calm down when I am stressed or upset, as the simple motion of typing out what you feel helps to take you away from the situation you're stuck in and concentrate more easily,"[2] said Grace, a participant in the Indiana University study. "Seeing a situation written down

#skinny
#diet #perfect
#bulimia #beautiful #stomach #ugly #gross
#model #flaws #body #slim
#thinner
#big #fat

somehow makes it easier to deal with, and so when I'm upset I write down why I'm upset on my blog."

Daily inundation with thinspiration still poses the risk of triggering eating disorder behavior and avoidance of recovery, but Yeshua-Katz notes that, "Recovery from an eating disorder, especially anorexia, is extremely difficult. Before we expect people with eating disorders to go into recovery we have to look at the recovery rates: for example, those treated for anorexia have less than a 50% chance of recovery within 10 years and a 6.6–15% risk of dying 10–20 years after the onset of symptoms."[3] Conventional modes of recovery have not been widely effective. However, writing about living with an eating disorder online may help bloggers learn to communicate their feelings in positive and productive ways, a helpful skill for therapy. For these reasons, Yeshua-Katz and Martins concluded that censorship of pro-ana blogs is inappropriate, and learning about the blogs could help make treatment more effective. Research is needed to demystify the effect that ED blogs have on recovery rates.

In the meantime, social media forums should concentrate their efforts on avoiding the alienation of thinspiration bloggers. If we stop the wild goose chase caused by censorship and keep bloggers in their current online communities, dis-

semination of supportive resources will be facilitated. Future interviews with bloggers should focus on the improvement of targeted, positive messaging by organizations like NEDA. Censorship is not the answer to the thinspiration craze.

After all, the "contagion" argument, that thinspiration imagery should be removed in an effort to protect vulnerable young women, is rendered less powerful when we consider that almost all glamorous representations of women in media are thinspiration. Someone seeking motivation to lose weight does not have to run an Instagram search for #thinspiration, because she can simply turn on the television or flip through a magazine to find the newest way to "burn fat fast." What we need is a complete cultural paradigm shift. We need a countertrend. Instead of #thinspiration, let us try #innerbeauty. Let us value women for their health, wellbeing, and content of their character, not for the size of their thighs.

If you believe that you or someone you know is suffering from an eating disorder, please do not be afraid to seek support.

Visit **www.nationaleatingdisorders.org** for more information.

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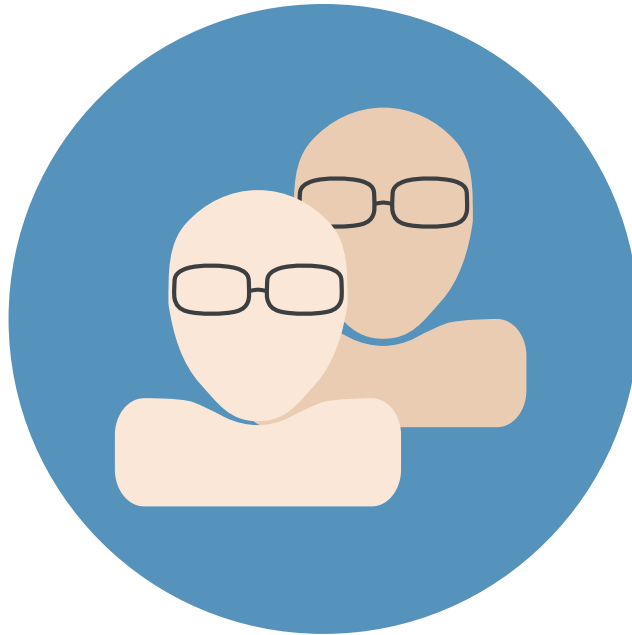
EXPERIENCE

The experience section presents public health challenges that students have encountered personally, highlighting the relevance of such issues to student life on a day-to-day basis.

Formula, Breastfeeding, and Nestlé

Molly McKinney

The Formula Craze in the Developing World

Most people in the United States know that when it comes to feeding infants, breastmilk is best. However in developing countries, breastmilk substitutes are often idealized as the "perfect formula" for growing babies. *The Lancet* reports that around the world, "suboptimum" breastfeeding is responsible for 1.4 million child deaths and about 35% of child deaths every year.[1]

In the developing world, consequences of not breastfeeding can be deadly. As a child, they need more and more food. Mothers quickly run out of free formula and coupons. This is catastrophic because a mother is equipped to make milk for her baby that supports its immune system and energy demands, but after a critical period, she cannot breastfeed her child. Most women are forced to dilute the formula to make it last longer, which is not sufficient to feed the child.

Child malnourishment has serious implications for development. 165 million children worldwide under the age of five are believed to be stunted or chronically malnourished, and more than 100 million are considered underweight.[2] UNICEF emphasizes that this damage is often irreversible. Malnourishment leads to immune system weakening.[3] This, combined with decreased immune support from lack of a mother's breastmilk, leaves a child more susceptible to illness and infection.

In communities without clean water, baby bottles cannot be properly cleaned and formula solutions become contaminated with pathogens, causing gastro-intestinal infections. This leads to diarrheal disease, dehydration, and death. The chance of an infant dying in a developing country if bottle-fed instead of breastfed is twenty-five times greater.[4] Promoting breast milk alternatives can therefore be catastrophic. Formula manufacturers play a role in influencing culture surrounding breastfeeding in society by marketing their products.

The Nestlé Boycott

In the 1960s formula producers looked to "third-world countries" to expand their market. Nestlé alone held $1.5 billion of the market (50%) in developing nations. In 1974, Nestlé was accused of unethical mass-marketing techniques. Health workers gave mothers free formula and discount coupons, their employees dressed like hospital staff to promote products, and they produced misleading ads implying that formula is best for a baby's health. Mothers who wanted the best for their children were susceptible to these ploys. In a Swiss court, the judge told Nestlé that they needed to "fundamentally" change their marketing strategies.[5] This attention led to the beginning of the Nestlé Boycott in the U.S. and then around the world.

Nestlé Boycott Poster
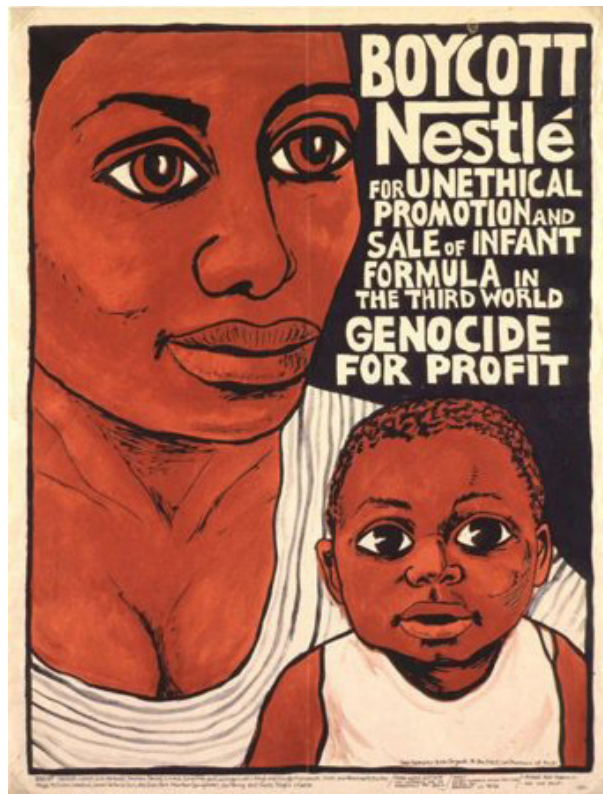
In 1981, the World Health Assembly responded to the boycott with the International Code of Marketing of Breast-milk Substitutes. This banned idealizing pictures and required "easy to understand" la-

A baby, born in the developing world, receives formula

bels with "appropriate language." They also banned product promotion and giveaways.[6] In some regions this code has improved breastfeeding rates, but in 1984 evidence against formula manufacturers re-surfaced and the Nestlé Boycott re-launched.

My Experience

I learned about the Nestlé Boycott just a few weeks ago in my Critical Issues in Child Health course at Stanford. I was especially interested in that particular lecture because of my own experience volunteering in a pediatric clinic on the island of Roatán, Honduras during the summer of 2012. I learned about the culture of breastfeeding and formula feeding in the community. There were a number of women who exclusively breastfed or formula fed and then some who did a combination. The pediatrician at the small clinic properly educated mothers about breastfeeding, but the clinic continually received samples of "EnFamil" and other types of breastmilk substitutes. Many mothers did not know the potential consequences of formula.

Mothers will do anything to ensure their child's well-being. As a volunteer, one part of my job was to triage the patients. I asked the mothers general questions about their child's allergies, reason

for visiting the doctor, etc. I measured the weight, length/height, and head circumference of the infants and recorded this data on the growth chart. I triaged around ten three-to ten-day-old infants per day. Mothers held their breath while waiting to hear each of the measurements and to see whether their child was in the normal range on the chart. After two weeks, I met Ethan, a pre-mature infant weighing just two pounds at birth. Ethan's mother did everything in her power to keep Ethan alive. She needed medication from the mainland, so the family pooled all of their money and collected donations from strangers and friends for Ethan's treatment. From what I have last heard, Ethan is healthy today.

Mothers will do anything to see that their child thrives even in low resource areas like Roatán. I did not know anything about the consequences of formula promotion until my course at Stanford. I hope that breastfeeding can be increasingly supported in places like Roatán so that children can reach their full potential. Every day, for more than a month I asked mothers whether they give breast milk or formula, "¿Le da pecho o polvo?" The direct translation is, "Do you give breast or powder?" After learning more about the detriments of breast milk substitutes, I realized that the Spanish

word for formula is quite fitting. Who would prefer manufactured dust over milk meant for the baby?

The Boycott Today

Nestlé's website FAQ section currently refutes breaking the WHA international code.[7] Mead-Johnson, maker of Enfamil, states that they abide by the WHA code so long as the country has adopted it by law.[8] UNICEF provides information on the status of countries that have passed laws that encompass the provisions of the international breastfeeding code. Countries have enacted the provisions to different extents; some have not taken any measures.[9] Despite these efforts to prevent adverse effects of formula marketing, countries are not always able to enforce the legislation. In 2004, the International Baby Fund Action Network published over 3,000 violations and 700 supporting pictures as evidence of companies violating the code.[10] Clearly there is much to be done. Countries need to improve enforcement of the international marketing code, health workers need to continue to educate mothers on the benefits of breastfeeding, and society must continue to support breastfeeding.

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Obesity and the Brain: The Correlation Between Exercise and Mental Capability

Dottie Jones

Worldwide obesity has nearly doubled since 1980.[1] The magnitude of the problem is so great that 65% of the world's population live in countries where people are more at risk of dying from being overweight or obese than from starvation.[2] In the United States, the problem is equally as severe; roughly 36% of American adults[3] and 17% of American children[4] are obese. Obesity is defined as having a Body Mass Index (BMI) greater than or equal to 30[5]. Obesity in America is an increasing problem that is harming people of every age. It is directly correlated with diabetes and heart disease; heart disease is the number one cause of death in the United States and diabetes is the seventh.[6] Obesity is not just an extreme health risk; as of 2012, Reuters reported that obesity in America is costing roughly $190 billion in healthcare.[7]

Among these unsettling facts, however, there is hope. There are many organizations working to fight the spread of obesity today; Michelle Obama's "Let's Move" campaign is one example of an organization trying to make a change. In addition, labs all over the country are studying the consequences of excess weight on the body. One such lab is the Brain, Obesity, and Diabetes Lab (BODy Lab) in New York City. I had the privilege of interning for the BODy Lab this past summer.

The BODy Lab is part of the New York University Langone Medical Center's Neuroscience Institute. Led by Dr. Antonio Convit, the lab examines the effects of obesity on the brain. Researchers have conducted several different studies and have found interesting yet horrifying results. One such study explored how obesity and metabolic syndrome impair the brain. Metabolic Syndrome (MetS) is the name for a group of risk factors, including hypertension, high blood sugar, and excess weight, that in-

crease one's risk for developing heart disease, diabetes, and stroke.[8] The BODy Lab's data found that "adolescents with MetS showed significantly lower arithmetic, spelling, attention, and mental flexibility and a trend for lower overall intelligence"[9]. Obesity is a problem that not only leads to heart disease, diabetes, and stroke but also adversely affects one's learning abilities. During my time at the lab, I had the opportunity to direct a project on a topic that interested me. I have always been interested in nutrition and exercise and so wanted to do research that incorporated one of those two topics. I chose to explore the question of how activity level and physical fitness relate to obesity (BMI, fat percentage, waist-to-height ratio), insulin resistance[10], and brain integrity[11] in adolescents.

I started my project by creating a data set from the lab's enormous database. I compared obese (BMI>30) adolescents to lean (18.5<BMI<24.9) adolescents, and properly matched them on age, gender, ethnicity, socioeconomic status, and years of education; this was to ensure my findings were not affected by other factors. I collected a vast amount of information on each person, having over thirty variables for comparison. Once all this data was compiled, I explored the relationships between variables. I mainly focused on BMI, waist-to-height ratio, VO_2 maximum (VO_2Max), fat percentage, insulin resistance, activity level, and the relationships between them all. I found a strong correlation between activity level and VO_2Max; VO_2Max is how much oxygen one's body is able to consume. My results showed that as activity level increased (from mild to moderate to high activity), the rate of oxygen uptake—VO_2Max—increased. This confirmed my previous knowledge that exercise in-

BODY
MASS INDEX
$$BMI = \frac{weight\ (kg)}{height^2\ (m)}$$

OVERWEIGHT	40.0 MORBIDLY OBESE	
	30.0 OBESE	
	24.9	
NORMAL	22.0	
	18.5	
UNDERWEIGHT	17.5	

creases physical fitness. I then began examining how this physical fitness affected BMI. My results showed that an as BMI increased, VO_2Max decreased. The results were the same for fat percentage, waist-to-height ratio, and insulin resistance. The relationships I found between the mentioned variables confirm how beneficial and significant exercise is not just for oxygen uptake and physical fitness, but also for fighting obesity. These results were as expected, but what was unexpected was the correlation between physical fitness and brain integrity.

After exploring the relationship between activity level and physical fitness on BMI and associated variables, I decided to investigate if they had any effect on the brain. And, in fact, they do. According to my data, activity level and physical fitness have an impact on the condition of the orbital frontal lobe, which is involved in decision-making and emotions.[12]

The dataset with which I was working with was relatively small, but clearly showed a positive correlation between physical activity and orbital frontal cortex (OFC) thickness. The OFC in obese adolescents was thinner than it was in lean adolescents, meaning there were fewer neurons and so fewer connections being made, contributing to impaired learning ability. This finding highlights the benefits of exercise beyond increasing endurance and lowering body mass to helping one's brain and productivity. It may not be intuitive that going for a run improves your mental capabilities. The BODy Lab's work is revolutionary because it demonstrates that the consequences of excess weight go beyond chronic disease to the scholarly success of our youth. What I learned at the lab gives me hope in an otherwise dismal situation because there is an obvious solution to the obesity crisis: people must simply move.

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[10]When your cells no longer respond to the hormone insulin. Insulin is responsible for regulating your blood sugar and is released every time there is an influx of sugar to bring your blood-sugar levels back to homeostasis. Insulin resistance is common in obese individuals because their cells are almost always flooded with insulin (due to poor nutrition) and so begin not to respond.

[11]Brain integrity refers to the condition of the white and gray matter of the brain.

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Hearing Express: an Innovative, Community-based Approach to Hearing loss in the Developing World

Abhishek Venkataramana

Hearing loss is an "invisible" disability. To the undiscerning eye, its consequences can remain hidden. Yet, for a hearing-impaired individual, the disability imposes significant economic and social burdens that rarely disappear without any formal treatment. Hearing-impaired individuals often experience delayed development and exclusion from society, and develop mental health issues[1]. In developing countries, these individuals often face severe stigmatization and disproportionately tend to struggle in school and with finding employment[2].

Despite the significant consequences of this hidden disability, hearing loss— perhaps, as a result of its "invisibility"—has failed to garner adequate attention from the global health community. The World Health Organization (WHO) estimates that approximately 360 million people suffer from disabling hearing loss; a staggering 80% of these individuals live in developing nations[1]. Yet, for decades, a simple, cost-effective solution to hearing loss has existed: the hearing aid. Hearing aid usage has largely eradicated disabling hearing loss from much of the developed world. Nevertheless, hearing-impaired individuals in the developing world continue to slip through the cracks of the global safety net. In developing nations, fewer than 1 in 40 individuals in-need will ever have access to hearing aid.[1]

One organization aims to relieve the global burden of hearing loss by replacing the conventional medical model of hearing aid fitting with an innovative, community-based approach. World Wide Hearing (WWH), a WHO chartered initiative, has recently developed a scalable model for delivering high-quality, affordable, digital hearing aids to poor children in developing communities. WWH's Hearing Express delivery model empowers local women in developing countries to become audio-technician entrepreneurs who go door-to-door in their communities, providing hearing aids, which can be custom-fit in under an hour, at a price-point that even poor individuals can afford.

During a home-visit in a central Jordanian village, Worldwide Hearing trained audio-technicians utilize mobile technology to fit Raif, a seven-year-old hearing impaired child, with a self-programmable hearing aid.

Through the Stanford's Design for a Sustainable World class, I had the opportunity to spend 9 weeks in Kraimeh, a small village in rural Jordan, where WWH recently launched its Hearing Express pilot test. I worked directly with the audio-technicians to field-test and iterate a mobile application our team created to help audio-technician entrepreneurs streamline the process of fitting and distributing hearing aids.

Through my work in Kraimeh, I was able to glean a unique understanding of the many challenges of providing basic health services in a rural,

resource-poor community. During the pilot test, the greatest challenges we faced were ensuring that the audio-technician women were able to provide professional quality hearing services and developing sustainable distribution strategies to optimize hearing aid delivery. These challenges forced us to adapt as we went, redesigning our mobile application and fine-tuning the business model.

The challenges we faced are by no means unique and affect many non-profit healthcare providers operating in developing countries. However, the innovative ways in which Hearing Express addresses these issues prove quite novel in the realm of public health, and serve as an excellent case study of how mobile technology and social-entrepreneurship strategies can significantly enhance the distribution of health services in developing parts of the world.

Ensuring the quality of health services in a de-medicalized context

De-medicalization, or the provision of health services in an informal, non-medical context is often a critical component of many successful basic healthcare distribution models. In communities such as Kraimeh, the lack of access to healthcare facilities proves the greatest barrier to health. Therefore, an efficient distribution model must bring healthcare directly to those who need it, in an efficient manner. In settings where a basic healthcare infrastructure is lacking or non-existant, this often entails assigning certain health functions traditionally assumed by physicians to non-physician community health workers, who can then be mobilized into communities in need.

Hearing care has traditionally been consigned to a strictly medical model of operation, which forces patients to report to expensive audiology centers that often take up to two weeks to deliver a hearing aid. WWH is working to shift the paradigm of hearing care by dissociating it from its medical milieu, and instead empowering underserved communities to provide their own basic hearing care and products, in a sustainable, self-sufficient manner.

Through this model, any trained community health worker can be mobilized to provide hearing care in any location where it's needed. However, as with any healthcare service provided by non-medically trained workers, quality control of the healthcare provisions becomes of utmost importance. WWH audio-technicians undergo a rigorous certification process, where they are trained by audiologists to screen for hearing loss, diagnose hearing impairments, and fit and maintain hearing aids. Throughout our pilot testing in Kraimeh, we found that the audio-technicians were able to accurately determine whether patients should be fitted with a hearing aid or referred to a medical specialist, and with practice, were able to successfully fit and repair hearing aids on their own.

Realizing that this may not always be the case, we designed our mobile app to minimize any potential source of error that could arise during a fitting. The app minimizes medical decision making and guesswork by guiding the audio-technicians through each step of the fitting, and serving as the primary basis of patient interaction. The audio-technicians go through a series of background and screening questions on a tablet together with the patient, then perform an otsocopy and record the results on the app. Based on the information entered, the app determines whether or not the patient is eligible for a hearing aid. Otherwise, the app will generate a referral for the patient to visit a medical specialist for more severe ear problems.

In future iterations, the app will stream hearing aid maintenance tutorials for patients and provide specific educational material for the families of hearing impaired. Though still in its early stages pilot test demonstrated how mobile technology can enhance the quality and reduce errors in healthcare provided community health workers while also actively engaging patients in the healthcare process.

Mobilization of healthcare provisions through mobile

WWH ultimately plans to deliver hearing aids to poor children on a global scale. Therefore, we designed the mobile application in order to help streamline the process of fitting a hearing aid for audio-technicians so as to maximize Hearing Express's impact and reach. The mobile application enables audio technicians to complete many of their routine duties—generating patient records, performing hearing aid screens, recording otoscopy results, scheduling fol-

low-up visits with clients, and keeping track of sales data—all using a tablet and in lieu of pen and paper.

When using a tablet, audio-technicians were able to able to reduce the time it took to perform a hearing aid screen and otoscopy from 15 minutes to under two minutes, which brought the total hearing aid fitting time to just under 45 minutes. More so, because the app sends all of the data to WWH headquarters in real-time, the audio technicians saved hours of time due to much faster record keeping. With the tablets, everything the audio-technicians need to fit hearing aid can fit into a small briefcase, meaning that they are no longer encumbered by having to physically carry binders full of paperwork.

Leveraging a Community-based approach to distribution

Hearing Express utilizes a micro-consignment model that combines a public health approach with micro-finance principles in order to incentivize sustainable, community-based healthcare. Women audio-technicians buy subsidized hearing aids locally from WWH and are able to work towards financial independence by providing hearing care services and products to those in need. The success behind this model lies in the community aspect of the work; by engaging and partnering with existing resources in the community and by leveraging local village social networks, the audio-technicians were able to successfully establish themselves within the community as providers of hearing aids. Furthermore, by living in the communities themselves, providers are readily available and well trusted.

For the pilot test, audio-technicians partnered with a well-known local village center focused on the education and care for special-needs children in the community. The audio-technicians started by fitting hearing aids on the hearing-impaired children at the center, and eventually through word-of-mouth, they were able to reach about almost a dozen other hearing-impaired children, and successfully establish themselves within Kraimeh.

Hearing Express ensures sustainability and also proves scalable to other communities around the world with a model that is completely community-sustained and driven by an incentive-based system for health providers.

The Hearing Express pilot in Kraimeh, Jordan through 2013 proved successful and in early 2014, the program will be expanding to serve the rest of Jordan, and begin expansions to South America and Africa.

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Images provided by author.

Infectious Disease Planning for Large Tourist Events-Dengue Fever and the Brazil Olympics

Emily Stebbins

In 2016, over 10,500 athletes from 205 countries plus press and tourists[1] are anticipated to descend on Rio De Janeiro, Brazil for the first Olympic Games held in a tropical region of South America.

In 2012, the same city that will host this prominent event declared a dengue epidemic, reporting more than 50,000 cases[2]. With this anticipated influx, Rio must prepare itself to prevent the spreading of this tropical disease to its visitors and likely unwanted media attention.

Dengue fever is the most commonly transmitted tropical disease among tourists[3]. The mosquito borne disease causes symptoms of high fever, exhaustion, sensitivity to light, and joint pains. While the symptoms are commonly mistaken for the flu, dengue fever poses a severe risk to patients as it lowers platelet levels. If secondary infection occurs, the victim suffers from dengue hemorrhagic fever, which can cause internal bleeding and even death. Currently, there is no direct cure for either form of dengue, and the treatments are mainly for the symptoms.

Because there is currently no vaccine, Rio should take more precautions to prevent spread of the disease. A study at Brandeis University's Schneider Institutes for Health Policy claims that for every $1 invested in dengue fever prevention and surveillance, $5 is saved[2].

Previously, Brazil has used chemical pesticides to curb the mosquito population in order to prevent the spread of dengue. However, despite spending the equivalent of US $1 billion in 2008, the rates of dengue infection in Brazil continue to rise, suggesting that chemical methods are not sufficient to control the disease[3].

Rio de Janeiro

The dengue vector is the *Aedes aegypti* mosquito, which thrives in poorly sanitized areas; stagnant pools and gutters provide ideal breeding grounds. Rio's overcrowded favelas (poor urban communities) epitomize this poor sanitation, and hilly geography causes rainwater to rush down into communities. As of 2007, only 60 percent of sewage was collected in Rio de Janeiro State and only 24 percent of it was treated. That same year, Rio de Janeiro implemented the Pacto pelo Saneamento that pledged to invest in universalizing sanitation[4]. However, the *Pacto pelo Saneamento* promises to increase sanitation to 80 percent by 2018 even though the Olympics will be in 2016. As an additional measure beyond chemical pesticides, Rio could benefit from investing more heavily in this program to reach desired results in time for the Games.

Additionally, Rio's health system is incomplete, with virtually no primary care (7.2% of the population has access) and the majority of sick citizens seeking care from federal and state hospitals[5].

As a tourist who navigated the Rio public health system while seeking treatment for dengue, I realized that the long lines and lack of patient privacy were a dramatic shift from what I experience in the United States. I worry that not only will it be difficult for the system not handle an influx of extra tourists but also the tourists may not be satisfied with this level of care. A reboot of the primary care system could be a solution.

Niterói, a Brazilian city with the same climate and population density as Rio, had half the dengue inci-

dences as Rio in 2008. Niterói, unlike Rio de Janeiro, reconstructed its healthcare system and expanded health coverage to 77% of the population. Health agents visited 82% of homes to look for indicators of foci of *Aedes aegypti* mosquito, compared to only 8% of homes surveyed in Rio[5]. Niterói serves as an example to Rio of how a more extensive primary health system, and specifically the additional health care presence in local communities, can protect people from dengue.

Finally, if dengue fever rates ultimately fail to decrease by the Olympics, on-site tourist education is critical. The fever, muscle and join pains dengue patients experience are often confused with the flu. Furthermore, an estimated 20 to 50 percent of cases are asymptomatic or go undiagnosed[6]. The Oswaldo Cruz Foundation of Brazil cautions that some of the most serious cases of dengue that lead to hospitalization manifest in first time infections[6]. To check if the fever becomes more severe, the disease is monitored through blood tests to assess plasma and platelet levels. The original symptoms must be recognized to start this testing. Thus, as tourists from non-tropical regions will likely not have previous dengue exposure, it is imperative that they can recognize the symptoms. Public education campaigns during the Olympics should be used as a preventative method from letting dengue go undiagnosed.

Children of Rio de Janeiro's favelas

In the past two decades Brazil has made tremendous progress in its economic and safety profile to be able to be the winning candidate for global sporting events like the Olympics. It appears prepared to host a successful Games as an emerging market, similar to China in 2008. Nevertheless, it would be unfortunate for a local phenomenon like widespread fear and reaction to dengue fever to cast a pall over the event. Akin in some ways to the worries about pollution in China when it hosted the Olympics, Rio's dengue problem requires attention and potential strong action by the government.

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RESEARCH

The research section invites the members of the Stanford community to share their essays, perspectives, and research with a broader audience interested in public health.

Healthcare in Afghanistan: The Situation Today and the Post-2014 Path

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Abstract

The last 12 years have been a critical time period for Afghanistan, a nation ravaged by civil war and strife. With Afghanistan's increasingly prominent position on the international agenda, foreign countries and non-governmental organizations (NGOs) are funding, aiding, and helping rebuild a land its president Hamid Karzai describes as an "unlucky country".[i] While improvements have been made to Afghanistan's healthcare system, creating and implementing a reliable, accessible, and self-sufficient public healthcare system remains a challenge. As the December 2014 deadline for the withdrawal of all U.S. and NATO-led troops' from Afghanistan rapidly approaches, the Afghan government must strive for economic autonomy, improved regional and domestic security, and educational reform in order to build and sustain an effective healthcare system. This review will discuss the current state of public healthcare in Afghanistan, look at areas of progress, and identify several key obstacles and why they remain. It will also assess how the 2014 transition will affect the current health system, and what Afghanistan can do to brace for changes in 2014.

Introduction

In July 2013, Rukhsana Bibi and her family made the trek from Laghman Province in Eastern Afghanistan to Lahore, Pakistan so that they could seek proper medical care. At age 17, Rukhsana was a newlywed in Afghanistan who had recently attempted suicide by consuming lye, a caustic agent commonly found in cleaning agents.[iii] It was impossible to figure out exactly what drove her to attempt suicide because her injuries physically prevented her from speaking. While ingesting the lye did not result in death, it de-

stroyed a significant portion of Rukhsana's gastro-intestinal tract including her throat, esophagus and stomach. Hospitals and medical clinics in her native Afghanistan did not have the resources to manage, not to mention treat, her condition. Desperately, she and her family traveled to neighboring Pakistan, where some of their extended family had settled, for proper care. Despite the vast amount of foreign aid and contributions, patients like Rukhsana are forced to migrate for medical care since Afghanistan has neither the infrastructure nor the personnel to adequately treat patients with more complicated conditions.

Figure 1 - On the Jalalabad Road in Eastern Afghanistan[ii]

Before 2001, the combination of the 10-year Soviet Union invasion starting in 1979 followed by the rise of the Taliban regime in 1996 destroyed a majority of Afghanistan's governing capacity. This left little to no health infrastructure. To this day, Afghanistan's health indicators remain comparatively and aberrantly among the worst in the world. The average life expectancy today is 49 years old.[v] The United Nations ranks Afghanistan as 175 out of 187 countries in the Human Development Index for 2013.

After 2001, the U.S. and NATO-led troops toppled the Taliban regime, they began the process of revitalizing a broken country. The United States alone has spent roughly $600 billion dollars on the war in Afghanistan, and over $50 billion in governance and development funds.[vii] While vast amounts of money and aid have been directed to Afghanistan's health system, self-sustainability is now an issue as the Afghan health system is critically reliant on foreign aid and contributions.

This paper aims to identify key problem areas in the Afghanistan health sector, and to suggest what the

Figure 2 - Rukhsana Bibi's Injuries[iv]

government and Ministry of Public Health can do to address these problems so that Afghans like Rukhsana Bibi can have better access to proper healthcare.

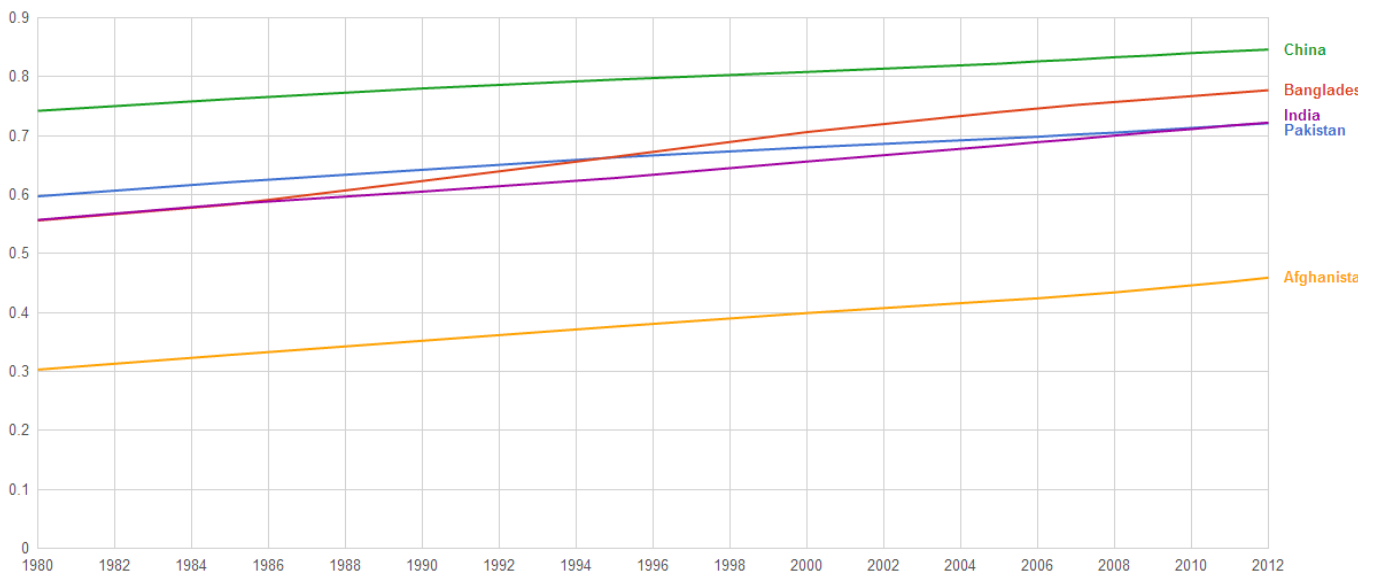**Areas of Progress**

Basic Package of Health Services (BPHS)

Launched in March 2003, the Basic Package of Health Services (BPHS) is a commitment made by Afghanistan's Ministry of Public Health to provide all Afghan citizens with public health care. It identifies the major health problems in Afghanistan and the best standardized service to alleviate them. Simultaneously, the BPHS takes into account cost-effectiveness, keeping in mind the limited infrastructure and need to cover both urban and rural populations.[2]

Distribution of BPHS is offered at four levels of health facilities - a health post, a basic health center, a comprehensive health center, and a district hospital. The higher the health facility levels, the larger and more comprehensive the staff becomes. District hospitals, the most expansive of the four, cover four districts and include a staff of doctors, female obstetrician/gynecologists, surgeons, anesthesiologists, pediatricians, midwives, pharmacists, laboratory and X-ray technicians, and dentists.

Improvements in Different Health Indices

Afghanistan's healthcare has improved in several different health indices in the past decade. Access to primary health services has improved significantly since 2000. In 2000, 9% of Afghans had access to primary health services within two hours of walking distance. By 2013, 90% of Afghans had access to care at this level. The goal by 2015 is to cover 95% of the population.[2]

In a 2010-2011 nationally representative sample survey conducted by the Afghanistan Multiple Indi-

Figure 3 - Comparative Human Development Index Trends, 1980 - Present [vi]
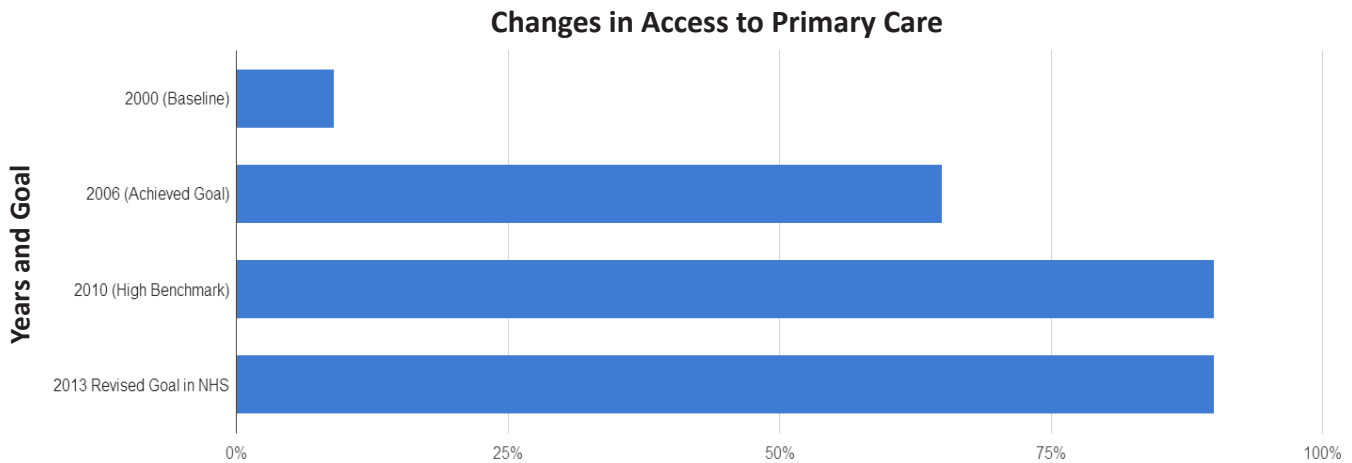
Changes in Access to Primary Care

Figure 4 - Percentage of Population with Access to Primary Care within Two Hours Walking Distance

cator Cluster Survey in collaboration with the Central Statistics Organization, child and maternal mortality rates have decreased since 2000 (although they remain very high in comparison to global estimates) and many Afghans have improved access to drinking water.[viii] While still considered polio endemic (further discussed below), Afghanistan's polio incidence has on average been in decline in the last decade due to a collaboration of international contributions and increased vaccination efforts.

Enduring Obstacles

An Unsustainable Path

While the Afghan National Security Forces (ANSF) provides some health care, the Afghan health system is heavily dependent on foreign aid and assistance. Donor funding constituted 60% of the Afghanistan's health system budget.[2] Furthermore, 82% of the population lives in regions where primary health care is provided by aid organizations.[ix] The Ministry of Public Health contracts out the implementation of BPHS to NGOs funded primarily by the World Bank, USAID, and the European Commission.[2]

Much of the aid and contribution coming into Afghanistan's health system is largely used for symptomatic relief rather than for the development of sustainable solutions. Over 700 ambulance vehicles were purchased for ANSF, but it is unclear whether there are enough properly trained EMTs in Afghanistan to operate such vehicles.[x] USAID is currently funding the construction of two hospitals being built in the Paktika province, but a 2013 audit report by

the Special Inspector General for Afghanistan Reconstruction finds the Afghan government may not be able to operate and maintain these two facilities.[xi]

External aid and funding is not only unpredictable but will likely decrease after NATO troops withdraw in 2014. Afghanistan must immediately start using foreign assistance to invest in developing long-term solutions that will disengage their health system from external dependence.

Decentralization of Health Care

The varied nature of health providers in Afghanistan leads to many problems relating to standardization, redundancy, and quality of care. A lack of communication and coordination between NGOs and provincial health departments has led to tension and redundant health services in segments of the population.[8] In bidding of contracts, areas that are more urban, accessible, and secure receive many more bids than do rural areas. For example, the contract for Badghis, one of the more remote regions of Afghanistan, received only one bid. Without a competitive process, NGOs lacking the capacity to provide sufficient and equitable health care may still be awarded a contract.[xii]

Access to primary health care has significantly increased, but there has not been an official qualitative assessment of such services. Anecdotal evidence from a 2007 World Health Organization report, however, suggests that health services covered by the BPHS — and therefore provided by foreign NGOs — are less than optimal with long waiting times, lack of laboratory services, and drug shortages.[xiii]
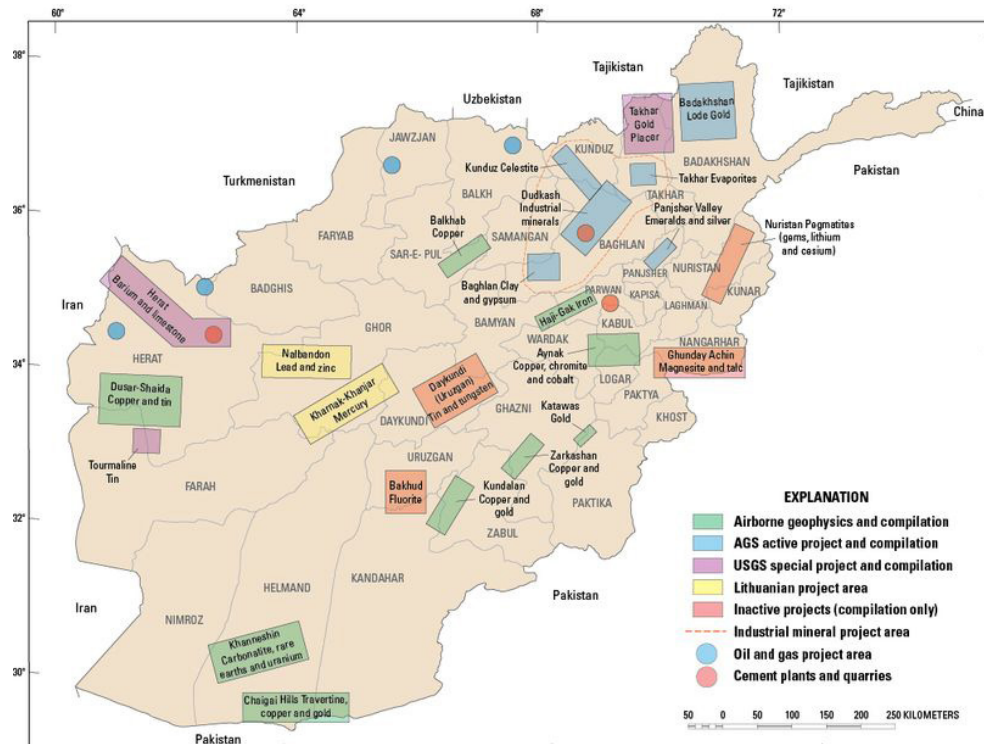
Figure 5 - 24 labeled regions with high-value minerals[xxi]

Concerns over domestic health workers' expertise

Worries about the quality of health services apply to domestically trained physicians as well. Two decades of civil war and destruction took a huge toll on medical education in Afghanistan. Medical training facilities were destroyed and of those that had not been demolished, the remaining schools granted admission to incoming students based on religion, ethnicity, and nepotism. There is no standardized curricula, duration, or methodology in medical education, leading to a highly variant set of standards for health workers.[2, 8]

Due to this a lack of cohesion in medical training and education, the Afghan government put in place a process of testing and certification to assess its health workers. They found that on average 70% of nurses, midwives, laboratory technicians, and pharmacy technicians do not meet the minimum standards and require extensive retraining. Furthermore, 50% of applicants have fake certificates.[2]

Due to the Taliban's stance against women's education, there are also very few female nurses and doctors for a culture in which the societal norms would dictate a female patient's preference for a female doctor. WHO recognizes a lack of qualified, female health workers as a major challenge currently facing the Afghanistan health sector.[2] Furthermore, approximately 1 in 50 Afghan women will die of pregnancy-related causes, with the risk five times as high in rural than in urban areas. These mortality rates are higher than those in nearby Bangladesh, Nepal, and Pakistan.[6]

Domestic Instability

Afghanistan's domestic security remains turbulent. Despite NATO troop presence since 2001, insurgents are steadfastly volatile. There were 3,000 civilian deaths as a result of the war in Afghanistan in 2011, more than any other year since 2001. United Nations estimates 77% of those deaths were caused by insurgents who have escalated their usage of improvised explosive devices and suicide attacks.[xiv] Attacks on aid workers have not subsided either. In 2007, 45% of Afghanistan's districts were inaccessible to UN aid workers for security related issues.[8] In 2010, ten medical aid workers treating cataracts and other eye conditions in the northern Badakhshan province were killed by the Taliban.[xv]

Projected Effects of the Withdrawal of Troops from Afghanistan in 2014

At the 2012 Tokyo Summit the U.S. pledged to

continue Afghan funding aid at current levels until 2017 and all other NATO allies pledged $16 billion through 2015, even as all international troops withdraw by 2014.[xvi] However, NATO provides much more than just funds - they provide extremely vital military humanitarian aid.

The U.S.-led Provincial Reconstruction Teams (PRTs) consist of military officers, diplomats, and reconstruction subject matter experts whose main objectives are to improve security, extend the presence and authority of Afghan central government, and spearhead rebuilding of roads, schools, administrative buildings, and other such reconstructive projects. Several teams have already disbanded in 2012 to begin the gradual transition.[xvii] In 2014, PRTs will no longer exist in Afghanistan as all such duties will be the full responsibility of the central government.[xviii] It remains to be seen whether Afghanistan will have the capacity to fill the void, although reports of negative effects from PRT closures have already surfaced. A local government correlates a lack of PRT-led reconstructive projects with less jobs and a worsened local economy.[20]

Additionally, NATO coalition medics provide medical assistance to civilians, especially to those in remote provinces. Because Afghanistan has the more landmines and IEDs than any other country in the world, combat vehicles are often necessary for the transport of medical supplies and other such humanitarian aid to rural parts of the country.[xix]

What needs to be done
Self-sustaining economy

Afghanistan is extremely poor, a target for insurgents, and is critically dependent on foreign aid. Despite all this, the country has an opportunity to achieve fiscal sustainability with the recent discovery of mineral deposits on their land. A 2011 study by the U.S. Geological Survey claimed there to be a vast and untapped source of mineral reserves in Afghanistan worth upwards of $900 billion dollars. In 2012, USGS released two maps charting out the locations of more than one million metric tons of rare earth elements in Afghanistan.[xx]

Investment in mining these unexploited sites could create thousands of jobs, jumpstart a highly unemployed economy, force infrastructure development (water and energy will be needed to power mines), feed an impoverished population, and finance critical sectors in government such as public health care. Currently, the government is already scouring for investors to develop mines - China and India both have contracts to develop copper and iron mines, respectively.

There is immense potential of mineral wealth for Afghanistan's future, but the government must not fall under the "resource curse" that young and conflict-heavy countries are prone to when developing an extractive industry.[xxii] The international community must keep a wary eye on Afghanistan, and ensure it does not become a mineral-rich but corrupt and plagued state like Nigeria or the Democratic Republic of Congo.

Improving Afghan medical programs

A standardized and effective curriculum must be created in the medical education system to ensure that the country's homebred physicians are qualified. Kabul Medical University has reduced its class sizes to allow for more attentive instruction, updated its nursing and medical school courses, and upgraded its teaching technology tools.[8] Improvements similar to Kabul Medical University's must be implemented in the Afghan health education system to foster a more effective, local medical workforce. Women should also be encouraged to enroll in medical programs to alleviate the shortage of female doctors.

Conclusion

Afghanistan has seen definite progress in the health sector within the past decade. However, there are many remaining obstacles that must be addressed before Afghanistan can be considered as a healthy state. For one, the current Afghan healthcare system must become self-sustaining, centralized, and standardized. To accomplish this, the Afghan government should begin by building an autonomous economy around mining. If the Afghan government adopts an intelligent and profitable strategy for their mineral-rich resources, it can use the profits to create an effective state-run health sector.

Regional and domestic security must also be realized. While Pakistan and India's own healthcare infrastructures are far from perfect, the two

countries have longer established healthcare sectors than does Afghanistan. The two neighboring countries could aid Afghanistan in building a stronger healthcare infrastructure — this sort of collaboration could result in not only a more stable Afghanistan, but also a peaceful South Asia.

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Modeling the Potential for Strategic Human Influence on Bacterial Behavior

Liz Melton

Abstract

Yearly reinvigoration of influenza, terrifyingly international transmission of SARS, devastating repercussions of Malaria and other neglected tropical diseases, and, most of all, dramatic and rapid spread of HIV/AIDS, have shifted the challenge from uncovering diseases to projecting the future of pathogenic evolution. Mathematical modeling can provide valuable information in regard to microbial population genetics, and recent phylogenetic analyses of bacterial and human communities provide evidence that human culture has impacted bacterial evolution. Founded on case studies of Mycobacterium tuberculosis evolution, this paper proposes modeling as a method of exploring ways of manipulating microbial populations via changes in human behavior.

Introduction

Not long ago, infectious disease epidemiology was considered a dying discipline. Experts and the laypeople alike expected that vaccines and cures would be rendered obsolete, stockpiled and utilized in the unlikely event of a global pandemic. By the turn of the millennium, scientists expected to have catalogued all transmissible microbes. Yet the field of epidemiology is far from extinction. The yearly reinvigoration of influenza, the latency of tuberculosis, the emergence of West Nile Virus, the terrifyingly international transmission of SARS, the devastating repercussions of Malaria and other neglected tropical diseases, and, most of all, the dramatic and rapid spread of HIV/AIDS, have shifted the challenge from uncovering diseases to projecting the future of pathogenic evolution.

Consequently, the field of disease modeling has catapulted to the attention of public health officials worldwide[1,2,3,4]. Mathematical modeling can provide valuable information in regard to microbial infectivity and microbial population genetics[1,3]. Literature suggests that human social, cultural, and migratory behaviors serve as evolutionary pressures on microbe genomes by gene flow between populations by migration and founder effects—the loss of genetic variation when a new population is established by a small number of individuals[3,4,5]. Founded on case studies of Mycobacterium tuberculosis evolution, this paper proposes that contemporary modeling be used to explore ways of manipulating microbial populations via changes in human social, cultural, or migratory behavior. These models may aid in extrapolating from human and microbe interaction to predict ways in which humans could deliberately alter microbe genomes to avert infection.

Human Influence on Tuberculosis: Founder Effects and Gene Flow

As of late, loss of genetic variation in sub-strains of bacteria has been attributed to cumulative mutation, migration, bottlenecks, and founder effects concurrent to the establishment of new human populations[4,5]. These phenomena were highlighted in a genetic analysis of culture-positive cases of tuberculosis diagnosed between 1986 and 2004 in Aboriginal Canadian communities5. This study utilized restriction fragment length polymorphism (RFLP), which allows researchers to determine variation in homologous DNA sequences. In this process, DNA samples are digested by restriction enzymes and resulting fragments are visualized via gel electrophoresis. In this study, RFLP testing classified tuberculosis-positive samples based on the number and location of the IS6110 transposable element. Aboriginal isolates were then sorted by tuberculosis epidemic. 61 bacterial isolates from 26 of 48 significantly distinct host communities possessed an extensive variety of RFLP haplotypes and spoligotypes, meaning that the frequency of a particular haplotype was significantly different from that expected under random mating, and that there was extensive allelic variation in direct repeat regions in strains of tuberculosis, respectively. Pepperell et al maintain that the wide-sweeping allele frequency changes observed in these communities

could not have been due solely to natural selection.

Interestingly, the emergence of other genetically variant microstrains has corresponded to human migration patterns in response to epidemic spread of tuberculosis. Pepperell et al affirm that European influence of infected Saskatchewan Aboriginal populations became more pervasive with time, inoculating many small populations of hosts never previously exposed to tuberculosis. Accordingly, the remaining 386 bacterial isolates from 21 other host communities were dominated by only a few, but highly prevalent, RFLP haplotypes. Decreases in genetic variation found in these small, detached populations are prime indication of tuberculosis evolution by founder effect[5]. Coinciding RFLP and historical data illustrate that gene flow by human migration was also responsible for tuberculosis genome differentiation[5].

Further promoting the case for modification by human effects, Pepperell et al did not detect a dominance effect—in which one allele masks the expression (phenotypically) of another allele at the same locus—within any strains of tuberculosis. Puzzlingly, the group that had more time to fixate on a fit mutant did not. Instead, researchers remarked that the "older" group (of 26 Aboriginal communities) possessed a much more diverse set of molecular variants relative to size in comparison to the "newer" (21 host community) group. What is more, a group of bacterial isolates with similar haplotypes that share a common ancestor and signature single nucleotide polymorphism mutation, called a haplogroup, was significantly associated with three epidemic peaks. The haplogroup network shape lends to a genetic drift explanation for strain variance. Strains of tuberculosis were almost certainly transmitted through consecutive, stochastic epidemics (multiple founder effects) in these host populations, rather than through progressive lineage domination[5,6].

Another Pepperell et al. paper provides supplementary historical and cultural defense for human-induced tuberculosis evolution[6]. Transformations to the Mycobacterium tuberculosis genome can be linked to contact between Canadian populations[6]. Pepperell et al explain that tiny tuberculosis populations persisted for over 100 years within socially segregated indigenous prairie populations. In particular, contact between Aboriginal and French Canadian populations was "consistent with historical human migrations connected with fur trade"[6]. Close social ties between sending and receiving host populations permitted migration of the tuberculosis bacterium through fur trade, reiterating the probability that migration and shifts in human culture stimulated gene flow in tuberculosis populations[5,6].

A fur trade voyager at the Fort[9]

Fittingly, minisatellite data point to Quebec as a source for human and tuberculosis gene flow into Aboriginal populations[6]. French Canadian fur traders incorporated what Pepperell et al deem the DS6Quebec lineage into indigenous populations, accounting for genetic variance in tuberculosis about a century before epidemic strains were manifest in Western Aboriginal communities[6]. Similar to the 2010 analysis, an analysis of molecular variance (AMOVA) and haplotype tree confirmed that, coincident with introduction of new strains into new host populations, tuberculosis lineages underwent rapid population expansion in star-like network topologies. Correspondingly, newly founded populations exhibit a minimal level of diversity. Thus, Aboriginal population haplotype networks, genetic diversity patterns of tuberculosis, and coalescent-based demographic

analysis of bacterial minisatellite data authenticate variable human transmission as a mechanism for cushioning small bacterial populations against extinction and for facilitating tuberculosis evolution[5,6].

A third paper corroborates Pepperell et al's findings on a global scale. High Functional Diversity in Mycobacterium tuberculosis Driven by Genetic Drift and Human Demography surveyed the genetic diversity of a global collection of tuberculosis strains using seven mega-base pairs of DNA sequence data. Ninety-nine human-adapted strains were selected to represent the broadest geographic and genetic diversity, and quantitative analysis, and once again supports a relationship between the evolution of tuberculosis and human migration[4]. Global data sets reveal that tuberculosis strains are "more genetically diverse than generally assumed", and vary by international region[4].

While Hershberg et al. cite air travel as a more evolutionarily recent contributor to the global spread of tuberculosis variants, global data reflects that tuberculosis population structure is associated with significant demographic changes and large-scale movements in human populations like those seen in the Pepperell et al Canadian data sets. Tuberculosis strains have been, and still are, under "extremely reduced purifying selection" and that, "as a result of increased genetic drift, much of this genetic diversity is likely to have functional consequences"[4]. Hershberg et al warn that increases in human population, urbanization, and global travel, combined with the population genetic characteristics of tuberculosis could advance the spread of drug-resistant tuberculosis. Ultimately, human-provoked genetic diversity in tuberculosis could affect the efficacy of diagnostics, drugs, and vaccines[4].

Admittedly, the three studies only concentrate on evolution of the tuberculosis bacterium. However, we can learn from the fact that human disease transmission networks beget genetic differentiation in microbes. Findings in these papers have lead Pepperell et al. to believe that "the structure of global tuberculosis populations is strongly influenced by the
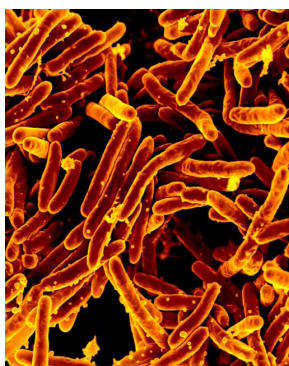
Mycobacterium Tuberculosis, the cause of TB[10]

social architecture of host populations apart from positive natural selection"[5,6]. Discovering a primarily human basis for trends in bacterial population genetics presents an ideal platform for modeling alterations to bacterial genomes by way of human behavior. Thus, we might anticipate that this precedent can be applied to other bacterial strains to predict and/or avert certain bacterial behaviors[1,3,7,8].

Modeling and Maintenance

As per The Dynamic Nature of Contact Networks in Infectious Disease Epidemiology, contact network models function as mathematical representations of population behavior. Unfortunately, a majority of these models have operated under the assumption that human contacts are chosen at random, and that networks remain static over time[7]. The fluidity of human contact itself, let alone evolutionary fluctuations noted in bacterial populations like tuberculosis, merits a shift away from static contact network models[1,3,7]. Aligning with conclusions from Pepperell et al and Hershberg et al, revolutionary models by Bansal et al show that physical contact can critically influence the extent and rate of disease spread and genomic evolution in pathogens[5,8]. Recently, epidemiologists have honed in on both "nodes" (individual hosts) and "edges" (interactions between hosts that could foster disease transmission) to create dynamic model systems[7,8].

Nowhere is the call for these dynamic models in public health research more obvious than in reducing resistance to antibiotics. In Evolution of Antibiotic Resistance by Human and Bacterial Niche Construction, Boni and Feldman testify that increasing frequency of antibiotic resistance in human bacterial populations has been a problem since the invent of penicillin[8]. Like human migration and cultural tendencies, treatment with antibiotics generates viability selection for antibiotic-resistant bacterial strains[1,2,7]. Resistant strains are usually less fit than antibiotic-sensitive wild-type strains in the absence of antibiotic treatment, but are more fit in its pres-

ence. Analogous to strains of tuberculosis (both in Canada and on a worldwide scale[4,5]), Boni and Feldman attest that resistant mutant strains of other bacterial pathogens often exist at low frequencies in a host. In these cases, treatment can actually be detrimental to the host as antibiotics can spur hypermutation. When treatment with antibiotics ceases or is slowed, the bacterial population can revert back in sensitivity, instigating evolutionary selection[2].

Equipped with this knowledge, Boni and Feldman created a niche model in which antibiotic use was considered a dynamic—as opposed to static—host trait. From this model, one can envision the effect of host antibiotic use on bacterial strain frequencies. By the same token, bacterial evolution affects host antibiotic use. But Pepperell et al and Hershberg et al findings suggest another variable simultaneously affecting microbial evolution: rates of human contact. Continuation of this cycle demonstrates dynamicity in bacterial behavior, and opens the door for possible human-microbe manipulation by tracking human contact and movement relationships. The impact of human social behavior cannot be discounted, so including the precise features of a contact(s) could produce models with insight for controlling bacterial evolution[1,7,8].

In order to investigate public health opportunities for directing the evolution of microbial populations by human activity, models must consider: the duration of one contact between two specific individuals, the frequency of contact events between two specific individuals, the order of contacts between pairs of individuals within a larger group, the concurrency (that is, temporal overlap) of contacts between one individual and a set of other individuals, and the rate at which the identity of a contact partner changes[7,8]. To accomplish this, one might construct what Bansal et al refer to as a "time-integrated network model". Time-integrated network models aggregate all contacts that may have occurred within a relevant period of time into a single static contact network[1]. On the other hand, this methodology could yield erroneous results because intensifying clustering and variance in contact distribution can boost final epidemic size. Using bond percolation, which describes the behavior of connected clusters in a random graph, Volz et al express that if one incorrectly assumes that infec-

tious periods are homogeneous, a model can become highly biased. Frighteningly, the magnitude of this bias amplifies with the degree of network clustering[8]. Therefore, a different modeling tactic alluded to by Bansal et al might better overcome these obstacles, and would optimize the chance of human-microbe manipulation[1,7]. Since Pepperell et al cite human migration as a source of tuberculosis gene flow, line graphs—models based on nodal movement—might be a more precise predictor of bacterial evolution[6,7].

Line graphs were originally used to model sexual relationships in the context of human STD research. But line graphs may also be used to model human-generated bacterial evolution more accurately by representing movement through nodes characterized by source, target, and date[1,7]. Edges occur when the movement target for one node is the movement source for another on the same or later date. In this way, line network models capture temporal and spatial sequence relationships—essential for monitoring evolutionary changes due to human contact and migration[7,8]. For human beings, there have been several network-based studies addressing the transmission of HIV and other sexually transmitted diseases that have successfully revealed dynamic contact behavior, giving hope that models could one day offer methods of human-microbe manipulation[1,4,8]. While these modeling procedures do not touch on tuberculosis specifically, investigating modes of microbial forecasting should be at the forefront of public health strategy.

Conclusions

Conventionally, humans take a parochial stance when describing the relationship between microbial and human evolution[3]. Past literature blames microbial morphology for obligatory changes to human social behavior[1,3]. However, recent phylogenetic analyses of bacterial and human communities provide evidence to the contrary. The opposite principle—human culture impacting bacterial evolution—has been clearly demonstrated in strains of tuberculosis[4,5]. Results of several studies show that branching and/or meshing of human populations have corresponded with documented founder effects and gene flow in tuberculosis populations[4,5]. If human contact could have been adjusted in Canada so as to restrain the degree

of evolutionary change to tuberculosis, could lives have been spared? In fact, could future lives have been protected with the formulation of a functional vaccine? With these questions in mind, modeling bacterial evolution due to purposeful human migratory movement, imposed founder effects, or targeted use of antibiotics could be extremely beneficial.

In order to best allocate health resources, legislators must be able to make more accurate predictions about the trajectory of disease spread. Public health officials could modify existing modeling devices for STDs and other diseases[1,8], and utilize bacteria-human interaction models to inform resource management—particularly in the case of antibiotic prescriptions[2]—and to experiment with the potential for manipulating microbial populations with respect to changes in social, cultural, or migratory behavior in humans[2,8]. Studies of tuberculosis strain evolution and the predictive success of recent disease models advocate for more dynamic models to interpret pathogenic evolution due to human-microbial interactions. One day, legislation founded on these models may make infectious disease epidemiology live up to its "dying field" prophecy.

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Perceptions of Depression: Stigma, Social Distancing, Level of Familiarity, and Attitudes Toward Seeking Help Among College Freshman

Paige Juliet Studenmaier

Abstract

Major depressive disorder is currently one of the most ubiquitous of mental illnesses, affecting an estimated 350 million people worldwide of all ages, ethnicities, and backgrounds. The National Institute of Mental Health[1] reports that the college years represent an especially vulnerable time. The following study seeks to understand the relationships between depression stigma, social distancing, attitudes toward seeking professional psychological help, and level of familiarity with depression. Because literature addressing depression in college populations is considerably lacking, investigating these relationships will be a valuable addition to the current understanding of stigma and help seeking behaviors.

Introduction

In a 2009 survey, the American College Health Association found that nearly 30% of students described feeling "so depressed that it was difficult to function" within their past year. Moreover, these students maintain a high risk for suicide—currently, suicide is the second leading cause of death among college students[2]. Identifying the association between depression and suicide consequently raises concerns as to why so many do not seek treatment. The most common reason for this low rate of help-seeking is stigma[3].

The detrimental outcomes that result from stigma are intertwined with many aspects of an individual's existence. Broadly, studies estimate that stigma ac-

Figure 1. The Culture of Silence around depression on campus.

counts for 25% of the reduction in treatment seeking behaviors[4]. According to the Mayo Clinic, this curtailment of treatment can lead to a worsening of symptoms, difficulty in managing the course of the illness, and even a higher risk for suicide[5].

Though much has been done to increase awareness for students coping with depression, recent studies suggest that only one third of mentally ill students actively use mental health services[6]. Researchers at Case Western Reserve maintain that "young people pick up cues about what is acceptable and unacceptable from those around them...If teens believe friends will distance themselves if their struggles with mental illness become known, they will endure the consequences and risks of disease without asking for assistance" [7].

This research will study four primary variables: 1) depression stigma, 2) attitudes toward seeking professional psychological help, 3) level of familiarity with depression, and 4) social distance desired from a student with depression. The findings of this research may direct future interventions to more effectively target stigmas specific to Stanford undergraduates, with the ultimate hope of reducing stigmas to reduce the prevalence of college suicide. Secondary benefits may include increased social integration, greater treatment adherence, decreased concern for social worth, and a better academic performance in students with depression.
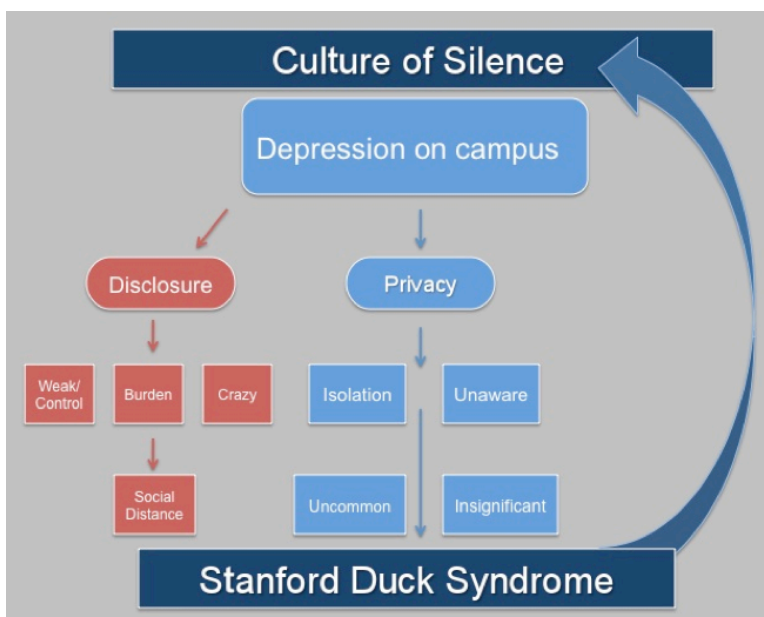
Methodology

In February 2013, a cross-sectional survey was conducted among the 1,768 freshman undergraduate students enrolled at Stanford University. The research received approval from the Stanford University Institutional Review Board in March 2012.

The study began with qualitative methodology to holistically understand how depression stigma manifests on campus. The first survey was conducted among residential staff members (n=29, 15 RAs, 19 PHEs), all of whom have completed training in mental health. Based on initial responses, a framework was developed to explain what participants deemed the 'Culture of Silence' at Stanford. The responses from this initial survey highlighted the tension students face in choosing whether to disclose their struggle with depression. By disclosing, students risk being labeled as weak, unstable, or burdensome to their peers, all of which precipitate social distancing from others. On the other hand, by remaining private, the student with depression is especially prone to isolation.

Furthermore, peers at Stanford are often simply unaware of the depression, and subsequently believe that depression is a less common or significant issue. Lastly, the Stanford Duck Syndrome, defined as a student's desire to appear in control while secretly struggling, is perpetuated by non-disclosure, further enabling the Culture of Silence.

The research from the residential staff responses subsequently informed the selection of four psychometrically proven measures: The Depression Stigma Scale (DSS), The Attitudes Toward Seeking Professional Psychological Help Scale, short form (ATSPPH), The Level of Familiarity Scale (LOF), and The Social Distance scale (SD).

Eight previously piloted questions were also included in the final Campus Attitudes Survey. These questions sought to capture an estimation of depression prevalence on campus, efficacy of Stanford's mental health treatment (CAPS), comfort discussing depression and recognition of college-age depression.

Results & Discussion

Initial study results demonstrated that depression stigma was positively related to social distancing, and negatively correlated to both attitudes toward seeking professional psychological help and level of familiarity. These findings corroborated existing research in that with higher levels of depression stigma, participants endorsed greater social distancing[14], less positive attitudes toward seeking help8, and less familiarity with depression[10].

Moreover, attitudes toward seeking professional psychological help were significantly related to comfort discussing depression, such that with more positive attitudes toward seeking help, students felt more comfortable discussing depression. This corresponds to the existing research that comfort discussing distressing

Table 1
Correlations for Major Variables

	Depression Stigma	Social Distancing	Comfort Discussing Depression	Attitudes Toward Seeking Help	Level of Familiarity Sum
Depression Stigma	****				
Social Distancing	.42**	****			
Comfort Discussing Depression	.093	.011	****		
Attitudes Toward Seeking Help	-.40**	-.17*	-.27**	****	
Level of Familiarity Sum	-.21**	-.30**	-.020	.13	****

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

information predicts attitudes toward seeking help[15].

Furthermore, higher levels of familiarity were statistically related to decreased depression stigma and social distancing. These findings correspond to the existing research and foundation of many anti-stigma interventions that increased level of familiarity leads to a lower endorsement of stigma[10,12].

The relationship between level of familiarity and attitudes toward seeking psychological help was insignificant. This conflicts with the existing literature that those with higher levels of familiarity with mental illness will have more positive views of seeking psychological help[16]. One hypothesis explaining this finding originates from the fact that this research was set within a university of highly educated students. Since higher education level has been found to mediate the impact of stigma[17], perhaps the context of this research played a greater role than the level of familiarity with depression. Table 1 displays these relationships.

This research also explored whether students with personal experience with depression differed from students without personal experience in terms of depression stigma, social distancing, comfort discussing depression and attitudes toward seeking professional psychological help. Students who self-reported personal experience with depression endorsed less depression stigma, and were less likely to distance socially. Additionally, though level of familiarity with depression and attitudes toward seeking help were not significantly correlated, when the analyses separated out students who had personal experience with depression,

students with personal experience with depression maintained statistically more positive views of seeking professional psychological help than students without personal experience with depression.

Further analyses used a multiple regression to explore the collective influence of depression stigma, social distancing, and level of familiarity on attitudes toward seeking help.
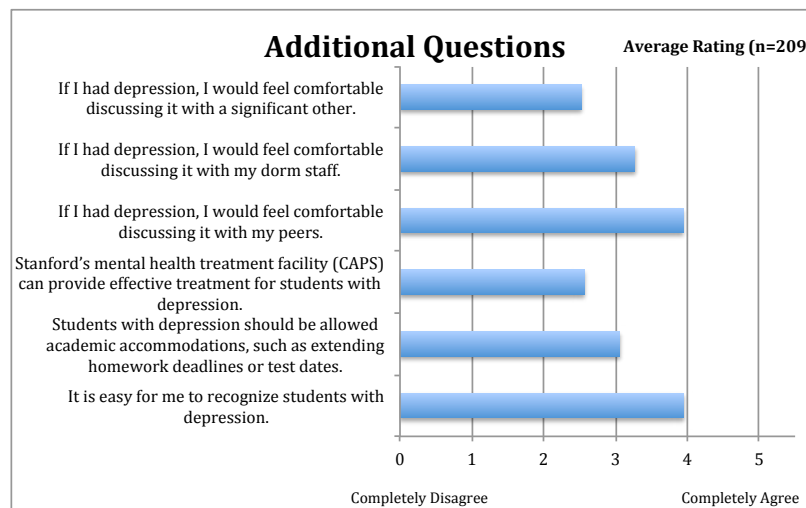
The results indicate that only depression stigma was a statistically significant predictor of student attitudes toward seeking professional help. These findings corroborated the existing research in that those with greater familiarity shared more positive views toward mental health services[10]. Comfort discussing depression was not statistically different for students with personal experience with depression.

Exploratory questions also provided several findings. Concerning the perception of the prevalence of depression, on average, participants agreed that it was easy to recognize students with depression, perceiving that depression impacted around 22% of their peers. Yet despite the reported ease of recognition, literature suggests that over 30% of students cope with depression[1]. This suggests that depression may be under-recognized. This study therefore suggests that when a campus under-recognizes the prevalence of a health issue, students struggling with that condition may receive less support.

Student views toward Stanford's Counseling and Psychological Services (CAPS) may help explain the lower rates of help-seeking among college students. When asked whether CAPS provided effective treatment for students with depression, the average re-

Table 2

Descriptive statistics for additional questions

Additional Questions   Average Rating (n=209)

- If I had depression, I would feel comfortable discussing it with a significant other.
- If I had depression, I would feel comfortable discussing it with my dorm staff.
- If I had depression, I would feel comfortable discussing it with my peers.
- Stanford's mental health treatment facility (CAPS) can provide effective treatment for students with depression.
- Students with depression should be allowed academic accommodations, such as extending homework deadlines or test dates.
- It is easy for me to recognize students with depression.

0   1   2   3   4   5
Completely Disagree   Completely Agree

Note: Besides the first question, which was rated on a percent scale of 0 to 100, the questions were rating on a Likert scale of completely disagree (0), disagree (1), somewhat disagree (2), somewhat agree (3), agree (4), and completely agree (5).

sponse scored between 'somewhat disagree' and 'somewhat agree.' Overall, since the view of CAPS appears ambivalent, help-seeking behaviors on campus may be severely reduced. The perception that a campus mental health center cannot help is a substantial barrier[16]. Thus in addition to raising awareness of the prevalence of depression, Stanford needs to increase confidence towards CAPS.

With regards to comfort discussing depression, students reported feeling more comfortable speaking with peers as compared to residential staff members and significant others.

This finding corresponds to existing literature that students often first seek help from informal sources[8]. Between dorm staff and a significant other, students expressed greater comfort speaking with dorm staff over their romantic partner. This result, while less expected, highlights the commonly expressed concern of risking a relationship by disclosing a struggle with depression[8]. In conclusion, since the young often forgo treatment out of concern for how others perceive them, it is imperative to "creat[e] a social culture where people feel comfortable getting treatment and talking about the illness with other who can support them [as] a vital initial step that can help people get better"[7].

The findings of this research emphasize the highly complex relationship between stigmatizing beliefs and help seeking. This research has identified three primary implications within the context of a college population.

First, this research corroborates the effect of greater familiarity with mental illness as a means to reducing stigmatizing attitudes and social distancing, and improving attitudes toward seeking professional help. Moreover, depression stigma was the only significant variable in understanding attitudes toward seeking help. Thus, with regards to improving the low rates of treatment utilization among the college age population[10,15], this research supports that increasing level of familiarity with depression may decrease depression stigma, and subsequently improve attitudes toward seeking professional help. These findings support that current anti-stigma interventions and higher levels of discussion can decrease stigma by means of increasing familiarity[10].

Recent studies have evaluated how closely individuals need to identify in order to reduce stigma, finding that personal contact with a socially contributing mentally ill individual to be the most effective[18]. Interventions akin to NAMI's 'In Our Own Voice' campaign, which consists of first-hand video accounts of mental illness, could be especially impactful on a college campus[19], especially if these accounts were to come from current Stanford students. These interventions will need to address the various myths about students who seek professional treatment[20].

A second implication of this research concerns the perception of treatment at Stanford. On average, students were ambivalent about whether Stanford's CAPS could provide effective treatment for students with depression. Thus in order to increase help-seeking behaviors on campus, Stanford needs to first improve the current ambivalence towards the campus treatment center. Additionally, since past negative experiences with professional help have been found to impact future help-seeking behaviors, it is extremely important for this population to have a positive experience with professional help.

The third implication concerns the relevance of depression and stigma to campus. When students disclose a struggle with depression, they undertake a risk—subsequently, negative past experiences with help seeking have been found to deter future attempts to elicit help8. This research finds that participants maintained more ambivalent attitudes towards speaking with a mental health professional, while endorsing greater comfort discussing depression with their peers. Thus disclosures of depression need to be met with encouragement and support, remaining cognizant that negative past experiences often deter future attempts to elicit help. Since peers are often the initial line of support, the entire campus needs to be aware and able to assist those with depression. Depression is thus truly a campus wide issue. Future interventions need to reflect this relevance, and reach out to both students with depression and peers in a supportive role.

In conclusion, this research suggests that there exist several significant relationships between depression stigma, social distancing, attitudes toward seeking professional psychological help, comfort discuss-

ing depression, and level of familiarity with depression. This research corroborates much of the existing research on mental illness and stigma, while examining depression specifically. Future research is needed to explore how strongly attitudes toward help seeking predict the action of seeking help.

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