

gOPINION

VIEWPOINT

Preparing the University Community to Respond to 21st Century Global Public Health Needs

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Previous investments in public health research and education played major roles in improving population health and increasing life expectancy [1,2]. In the early 1900s, amidst efforts to eliminate hookworm from the southern United States (US), Welch and Flexner recognized the need to train public health leaders. They proposed a freestanding public health school affiliated with, but independent from, the university and medical school, charged with training a public health workforce to improve the lifespan and “health span” of populations [3,4]. We now stand at a similar junction as in 1900, confronted with a vastly different set of growing health burdens: chronic non-communicable diseases (NCDs) [5]. These diseases cause significant mortality and morbidity on their own, but also exacerbate existing population health issues. For example, diabetes can increase the risk for tuberculosis [25]; anti-retrovirals given to HIV/AIDS patients can increase cardio metabolic risk [26,27]; under-nutrition *in utero* or during early childhood increases risks of NCDs later in life [28]. Here, we argue that the university community (UC), with its key constituents (institution leaders plus faculty and students derived from all disciplines), can be leveraged to improve 21st century public health.

Driven by a common set of behavioral risk factors (diet, physical inactivity, tobacco and alcohol use) and underlying environmental exposures (e.g., rapid urbanization and globalization of societies), NCDs – heart disease, stroke, diabetes, chronic respiratory illness, and cancers, as well as mental health disorders and injuries – now con-

tribute to 70% of global morbidity and 60% of mortality [6]. Approximately 80% of these chronic disease deaths occur in low- and middle-income countries (LMICs). Moreover, precursors to NCDs are being seen in children in both developed and developing countries [7–10] and age-standardized mortality from NCDs is higher in LMICs than in HICs, indicating that younger people are dying of these diseases in these poorer regions [11]. This presages an unprecedented explosion in disease burdens once these youth reach adulthood – and equally large increases in health care costs and lost productivity [12]. Without action, the World Health Organization (WHO) estimates losses of US\$84 billion in economic production between 2005 and 2015 in certain LMICs [13]. In response to this large and growing health, social, and economic burden of NCDs, the United Nations has scheduled a High-Level Meeting (UN HLM) on NCDs with heads of state at the General Assembly in September, 2011, only the second such UN session on health ever (the first was on HIV/AIDS in 2001) [14].

NCDs require a vastly different style of public health action, one that acknowledges how underlying drivers of NCDs are deeply entangled in the economic and societal fabric of modern life, and that addressing NCDs will require resources and stakeholders outside of the health sector. To achieve this, the focus and specific targets of 21st century public health must be re-considered. Aspirations to rapidly modernize and integrate into the “global” play major roles in determining

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economic and trade policies, consequently influencing the nutrition and activity patterns of people in LMICs [15]. Such disease determinants are difficult to comprehensively address by the medical and public health professions alone. Rather, input from multiple professional perspectives is required. As a way of bringing together diverse stakeholders, a 2010 Institute of Medicine (IOM) report recommends incorporating an intersectoral approach to interventions, involving multiple actors across a broad spectrum of disciplines and content expertise [12].

Here, we argue that it takes the whole UC to address NCD prevention and health promotion whereas treatment often remains the domain of the health sciences. The future leadership that will drive prevention for global public health in the coming century will require a different model of training than contemporary leaders. Actively executing NCD prevention and health promotion requires familiarity in cross-disciplinary, systems-wide strategies. Acknowledging the lessons learned from the historical role of UCs in eliminating disease and promoting health [1,2] and key messages of the 2010 IOM report, we highlight four actionable and practical strategies that UCs can take in order to the global response to NCDs. First, UCs must re-focus on training versatile global health leaders; second, UCs should encourage interdisciplinary research; third, UCs can facilitate the creation of and support for academic partnerships; and fourth, UCs should support student advocacy efforts, bolstering the previous three actions. Lastly, we discuss the financial barriers to these recommendations, and potential solutions (Fig. 1).

CURRENT AND FUTURE ROLES OF UCS: CURRICULAR AND INSTITUTIONAL REFORM

Preparing versatile global health leaders across disciplines. The public health challenges of the 21st century are increasingly interdisciplinary and global, with interconnected drivers spanning multiple disciplines and transcending national boundaries [16]. Improved national coordination and collaboration across sectors (including the private and voluntary sectors) are common mantras in public health, but these ideas do not always translate into educational models. Universities can play a role in realizing these ideals by training students to be versatile and “global”, cognizant of the com-

plex determinants of NCDs, deeply aware of challenges, yet prepared to engage in mutually-beneficial real-world solutions.

Education, therefore, needs to extend beyond basic biomedical sciences, considering wide-ranging perspectives from policy to implementation, economics to sustainable development, agriculture to urban planning, and anthropology to business management [17,18]. Tackling tobacco use, for instance, requires inputs from economics, criminal justice, international and domestic law, and agriculture for durable progress. Similarly, reducing saturated fat in consumables requires insights from trade law, food processing, agriculture, basic science, and business. These disciplines are uniquely housed together at universities, but connections are often not fully developed or if they are developed, they are not fully utilized.

Another important consideration is that disciplines *within* public health are organized such that current structures encourage students to focus their training and specialize in epidemiology, biostatistics, environmental health, policy, behavioral science, clinical research, basic sciences, or other tracks, but could benefit from increased cross talk among these disciplines. Evaluating current NCD curricula in clinical, public health, and research training programs could provide initial assessments to guide development of such connections and improvements in global NCD training, leading to an improved professional workforce and, in turn, an improved global response to NCDs. Developing cross-disciplinary programs that address health in total (rather than being disease-specific) is also an important step in tackling co-existing disease burdens. For instance, traditional nutrition courses that focus on maternal and child health, micronutrient deficiencies, and under-nutrition could be expanded to include the effects of such under-nourishment on future NCD risk, as well as chronic illnesses can limit nutrient absorption and contribute to micronutrient deficiencies.

As a first step, we recommend that universities form “task forces” comprised of students, faculty, and university leadership, to examine key issues and barriers related to global NCD training within the appropriate institutional contexts. Although this is a small step to take, it is one that requires few external resources upfront, unifies interested and invested stakeholders, and could stimulate further action whereby other UCs could adapt their own local solutions. Additionally, piloting new models of global health training, such as innovative

| Approach: | Specific Recommendations: |
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| Preparing Versatile Global Health Leaders | <ul style="list-style-type: none"> Introduce global health into existing curricula, with a focus on societal and cross-disciplinary aspects of health Share existing curricula between universities, utilizing common digital hubs (e.g. CUGH website) for dissemination Provide curricula in open-access format to students globally |
| Encouraging Interdisciplinary Research & Action | <ul style="list-style-type: none"> Encourage and provide incentives for at least three university departments to collaborate for any global health program Introduce cross-disciplinary global health activities (e.g. case competitions) Increase support for translational trials in real-life settings |
| Creating and Supporting Academic Partnerships | <ul style="list-style-type: none"> Expand partnerships to include NCDs and primary care Engage national and community-based stakeholders on population-wide NCD prevention efforts |
| Supporting Student-Led Advocacy Efforts | <ul style="list-style-type: none"> Work in concert with youth and trainees to lobby for social reforms Lead by example, including adopting amendments to university policies (e.g. non-exclusive licensing, smoke-free campuses) |
| Addressing Financial Barriers | <ul style="list-style-type: none"> Encourage synergy between clinical health services and population-based approaches and funding sources Seek non-traditional and diverse sources of financing from foundations, the public and private sector |

Fig. 1. Approaches and Recommendations to the University Community.

interdisciplinary doctoral programs or post-doctoral global health programs with extensive field-based components and a focus on the social determinants of health, could expose scientists to the realities and complexities of LMIC settings.

A current example of integrated curricula includes the interdisciplinary Master's in Development Practice programs at Columbia and Emory Universities, started in 2007 and supported by the MacArthur Foundation. Development is viewed from the perspectives of health, financial management, infrastructure, policy, and education – aiming to train problem-solvers, and utilizing information technology to connect students and practitioners around the world in real-time. Another example of technology overcoming traditional barriers and stimulating wider understanding of societal drivers of NCDs (such as food policy) can be found in an open-access course on the Biology, Psychology, and Politics of Food, taught by Dr. Kelly Brownell at Yale [19]. US medical schools are following suit, currently requiring students be exposed to “content and clinical experiences related to each phase of the human life cycle that will prepare students to recognize wellness, determinants of health, and opportunities for health promotion...” The UC could similarly mandate exposure to courses that provide an interdisciplinary overview of global

NCD burdens and their solutions as well as share open-access curricula, potentially via the Consortium of Universities for Global Health (CUGH) website.

It is important to point out that in today's increasingly globalized world, highly driven prospective students and post-graduate trainees, regardless of their field of study, are interested in global health. The development of interdisciplinary programs that allow non-health students, such as those in business or law schools, to incorporate elements of global health training, may ultimately help universities to attract the top candidates and develop future leaders. Moreover, these students provide fresh perspectives and insights from other fields that can enrich the learning experience of fellow students as well as the teaching experiences of faculty. Thus, global health education becomes collaborative, with mutual gains and contributions, and would lead to development of global leaders who can work effectively across national boundaries, collaborating with colleagues from around the world.

Encouraging interdisciplinary research and action. In addition to training a new kind of student, universities *themselves* must adapt and become more interdisciplinary, with a focus on translating knowledge into implementation. The Fogarty Framework for Global Health Programs exemplifies such an inter-sectoral approach, requir-

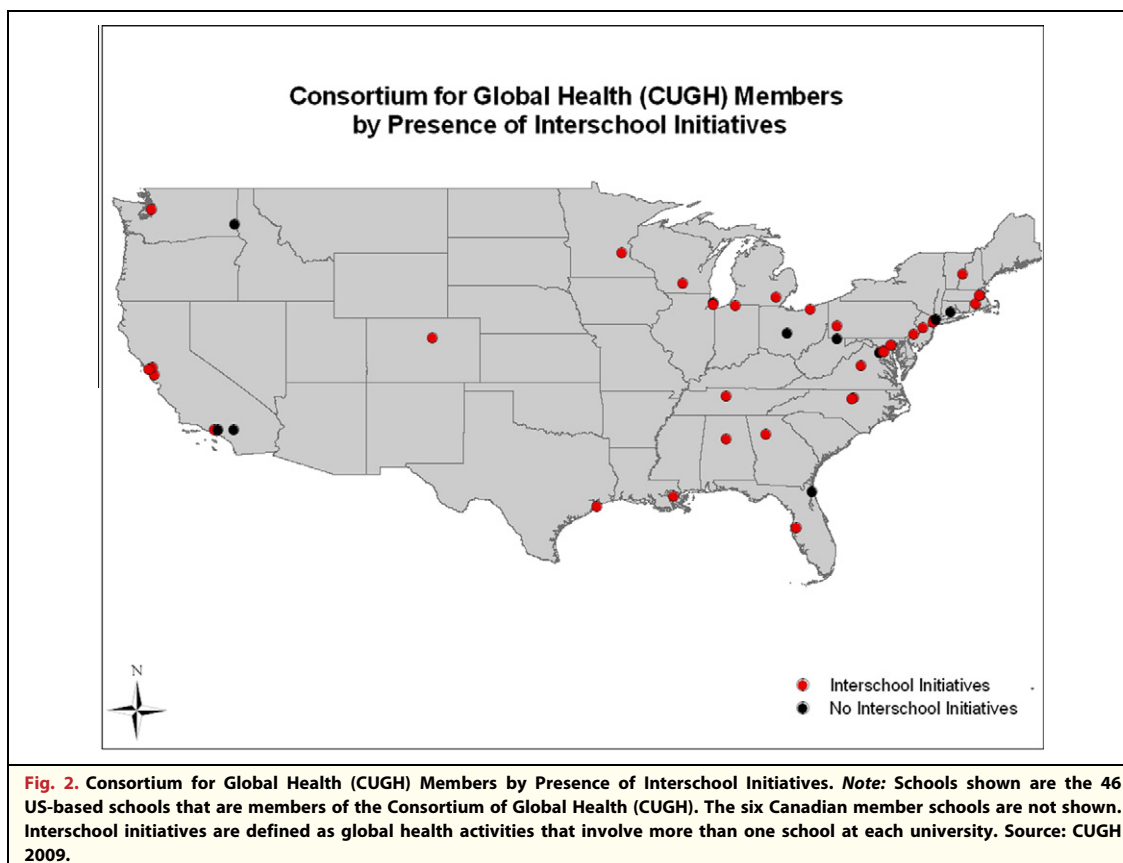
ing that at least 3 university departments collaborate for any global health program [20]. There is incredible potential to further develop interdisciplinary models. For example, 78% of US members of CUGH feature inter-school global health research activities (Fig. 2), providing a platform for scalability of collaborative interdisciplinary activities. In particular, programs with NCD-related research may benefit from partnerships, increasing their scope and impact. One example comes from Yale University's Sustainable Food Project, which allows undergraduate and graduate students to participate in food production from seed to table, and to learn about the policy issues that affect availability and pricing of locally-grown produce [21]. In addition, extracurricular programs such as case-competitions can promote engagement from students representing diverse academic and vocational backgrounds in pursuit of solutions to complex and very real global health problems [22]. Students embrace professional decorum and interdisciplinary teamwork experiences and are incentivized to work together, recognizing the value of these refinements for future careers.

It is not enough to teach students about the inter-disciplinary nature of global health; they must also know how to put such knowledge and ideas into practice. Implementation science and research thus becomes a vital part of 21st century global health education. Defined as the scientific study of methods to promote the uptake and successful integration of research findings and evidence-based interventions into healthcare policy and practice, by developing and evaluating practical solutions to common challenges, implementation research is vital for tackling real-world problems, but also requires a new kind of thinking [23]. For example, current and future researchers need to be able to think beyond the traditional randomized control trial as the gold standard for testing interventions [18]. Fostering interest in translation trials can add externally valid evidence to support extensive implementation of science-based findings into real-life settings. Such trials are currently lacking, as is a sufficiently large and expert workforce to achieve and sustain the benefits from intervention. One example is the Community Interventions for Health, a community-based intervention that includes environmental scans, subsequent design, and implementation of community and sector-wide interventions in schools, workplaces, and health centers to modify the effect of the built environment on lifestyle factors [24].

Creating and supporting academic partnership opportunities. International collaboration is vital to avoid creating scattered silos of research and action. Academic partnerships can strengthen research and implementation capacity on both sides of the relationship, promote productivity that benefits both partners, and produce research that maximizes the local relevance and feasibility of intervention approaches. Support of this kind is especially important in countries where infrastructure and capacity for public health is weak or non-existent. Involving the UC within LMICs is also critical as these academicians engender an impartial stance amidst vested stakeholders in a role of providing objective recommendations based upon locally relevant research, while engaging in training future generations of leaders.

Historically, global health partnerships have focused on tropical and infectious diseases, yet these can provide a platform to broaden the scope to include NCDs. The Academic Model Providing Access to Health Care (AMPATH), for instance, is a salutary partnership between Moi University School of Medicine and a group of US and Canadian universities, supported by USAID. The group reaches a catchment of 2 million people, serving as Kenya's largest HIV initiative. AMPATH is now using the HIV experience to guide expansion towards expanding to comprehensive primary care programs, and includes addressing NCDs [29]. Another example of successful collaboration comes from the Grenada Heart Project, a partnership between an academic medical center in the US (Mount Sinai), the government of Grenada, international non-governmental organizations, and community stakeholders. In collaboration with various government ministries, the program is developing inter-sectoral policies that incorporate NCD prevention and control. Other activities include formulating, implementing, and evaluating community-based interventions to improve the cardiovascular profile of the people of Grenada.

Global NCD research is increasingly moving towards these partnerships, which can provide lessons of what works and what does not in various settings, help identify common, broad interventions that can be adapted to diverse settings, facilitate cross talk between various sites, and help develop workforce capacity [30]. For example, 11 chronic disease centers of excellence (based on university or research institution networks) in LMICs, partnered with HIC universities, are collaborating to



increase NCD surveillance in regions where data is scarce and to identify the most feasible population-level intervention strategies for use in diverse settings [31].

The Fogarty International Center has also taken a leadership role in this area, devising strategic plans focused on NCDs and implementation science and funding a variety of fellowship training mechanisms. Junior investigators from LMICs are able to immerse themselves in US institutions for short non-degree training periods, experiencing an alternate research culture and a level of productivity and expectations that may help establish independent careers [18,32]. Other programs like the Fogarty Clinical Scholars program allow US students to spend time undertaking research in LMICs, fostering bidirectional learning and knowledge-sharing. Strengthening research institutions in LMICs, including building supportive research environments, is of the highest priority in building a new generation of leaders who will shape the global NCD debate in their home countries [33].

Supporting student-led advocacy efforts. University students have a special role in advocacy and activism efforts. Students are uniquely positioned,

with energy and idealistic zeal combined with unfettered access to knowledge/information and prominent thought leaders. Critically, students do not have ostensible financial agendas or vested interests. Historically, students have powerfully represented and amplified the interests of marginalized groups – e.g., low-income immigrants, refugees, laborers and, most famously in the US, populations suffering from overt racism. Momentous social movements in South Africa (anti-apartheid), the US (civil rights), and China (Tiananman Square) are all characterized by the narratives and leadership of university students.

There are also examples from the global health sphere. The Student Global AIDS Campaign was developed on the heels of HIV/AIDS activism to “Fund the Fight, Treat the People, Drop the Debt, Stop the Spread” in 2001. Ten years ago, a Yale Law student spearheaded a movement to improve access to university-developed essential medicines, including life-saving antiretrovirals for HIV/AIDS [34]. Today, equitable access licensing policies to ensure global access to life-saving health innovations (drugs, vaccines, diagnostics) emanating from university laboratories have been adopted

widely by leading universities (Harvard, Yale, Brown, UPenn, Boston University, Oregon, Emory, and others). High-level negotiations with senior technology transfer officers, provosts for research, and university presidents helped pave the way for these movements. The movement itself demonstrates the power of concerted action within the UC, as well as the unparalleled connectivity with modern-day technology enabling proliferation of awareness and action across campuses nationwide. As of 2010, over 35 institutions have adopted mandates to openly provide health intervention tools and instruments, including government health institutions (e.g., the National Institutes of Health and Centers for Disease Control and Prevention) [35].

The IOM report specifically encourages integration of student-led advocacy in NCD prevention and control efforts. Already, unification of young professionals with a common goal to mobilize trainees in all disciplines to combat NCDs has been realized in the form of a Young Professionals' Chronic Disease Network [36]. The group is engaged in open advocacy, as well as partnership with senior faculty on developing symposia and lectures that are publicly accessible and available [37].

ADDRESSING FINANCIAL BARRIERS

A key question moving forward is how to finance the specific strategies proposed in the realms of education, research, partnership, and advocacy? For instance, institutional (in-house) support for global health programs even among CUGH is weak – only 21 of 46 (46%) CUGH institutions invest in their own global health programs. Especially in the current limited funding climate, it is critical to search for new and innovative funding mechanisms. Traditionally, federal funding for medical and public health research is obtained from national agencies. These are viable funders that should not be overlooked. However, beyond these traditional avenues, a wider variety of funding sources may become amenable. For example, encouraging synergy between clinical health services and population-based approaches may help in seeking additional funding sources outside the traditional health sector (where NIH support remains the gold-standard) to winning grants from other sources (e.g., USAID, USDA) and major private foundations in the domains of urban planning, nutrition, and psychology. Civil society advocacy organizations, such as the American Cancer Soci-

ety and the International Diabetes Federation, which are leading calls for action in the lead-up to the UN HLM, may also be considered. Funding may even be sought from the private sector, such as the food and beverage industry, to foster health promotion, as was recently done at Yale University [38], although such an association is accompanied by potential risks [39]. Finally, there is a need for commitment from local, regional, national, and international public health agencies that can support and collaborate with universities as they test new models and curricula.

CONCLUSIONS

Over the past century, a sizeable proportion of the 30-plus years gained in life expectancy in the United States has been due to non-medical factors [40]. Despite distinctly different global disease burdens today, an inter-sectoral approach to health promotion and NCD prevention remains necessary. This notion, in particular, compels our UCs to re-imagine their training and curricula in addressing health through all the available perspectives (not just the medical one). Historically, the spectrum of UC activities has ranged the full gambit from training and education, to actionable interventions worldwide, to evaluation of interventions in international health, public health, and now global health [17]. Incorporating perspectives of multiple disciplines is the key to developing a systems-level understanding and conception of population dynamics and evolution in the 21st century; a medical school or a public health school cannot do this alone.

There are positive signs of change. Public health schools have expanded to include informatics, genomics, communication, cultural competence, community-based participatory research, policy, law, global health, and ethics [41]. Public health is increasingly and sensibly being situated in a complex ecological framework with multiple interaction layers. Moreover, schools are realizing that to be a state-of-the-art academic health center, it is not enough to focus solely within the US – universities must engage with the 21st century globalizing world. Public health has become global health – with threats and opportunities shared across national borders. This is illustrated by investments in global health capacity over the past decade, e.g., CUGH is a rapidly evolving organization of North American universities committed to global health [17,22,42], while the International Association of

National Public Health Institutes (IANPHI) has established a framework for critical locally-driven planning for policy makers, capacity-building, and financing that could maximize population health gains, providing high returns on investment [43].

Yet, more must be done. Without swift and sustained action addressing both the medical and non-medical drivers simultaneously, the NCD burden – already overwhelming in nations both rich and poor – will continue to rise. We encourage public health schools, medical schools, and universities to work together to make sure that a new cohort of professionals, possessing the requisite knowledge, research skills, and practical experience from the field, is equipped and incentivized to deal with the global challenges ahead. The UC has the responsibility to lead by example (e.g., smoke-free laws on US university campuses are still not normative) and its role in making a contribution to

global health cannot be overstated. Local campus-wide student, administrative, dean, and presidential-level working groups can help initiate the process of curricular reform with systematic focus and specificity. We hope these comments from a unique constellation of university constituents – students, senior faculty, global health directors, and administrators – will help spark such empowered working groups nationwide. Let's invest in a healthy and productive future, starting now.

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