

Understanding the Relevance of Global Health to North Carolina

Lisa Hawley, Nicole Fouche, Willard Cates Jr, Margaret E. Bentley

Around the world, countries and communities are addressing a diverse set of global health challenges. The range of global health problems include human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) and other infectious diseases, sexual and reproductive health, child health, chronic diseases, climate change, nutrition and food security, and health systems strengthening. Solutions to these profound global health issues, as well as their programmatic implementation, require the effective mobilization of science, technology, and interdisciplinary research.

Funding for global health has increased substantially from all sources—government and private—over the past 10 years. Worldwide, health-related assistance from the Development Assistance Committee members of the Organization for Economic Cooperation and Development tripled from \$7.6 billion in 2001 to \$26.4 billion in 2008, a 247% increase [1]. The United States, in addition to being a major contributor to the Global Fund, is the largest donor to global health efforts in the world [1, 2]. From 2003 through the present, the President's Emergency Plan for AIDS Relief and the Global Health Initiative (GHI) have defined the United States' funding priorities for global health. The broader GHI focuses on the following areas: (1) HIV and AIDS, (2) tuberculosis, (3) malaria, (4) maternal health, (5) child health, (6) family planning and reproductive health, (7) nutrition, (8) neglected tropical diseases, and (9) health systems strengthening [3]. HIV is expected to continue to dominate the health priorities funded by the GHI through 2014 (Table 1).

Global Health and North Carolina: A Complementary Pair

North Carolina's Research Triangle Park is appropriately viewed as one of the top biotechnology regions in the country [4, 5]. It is also one of the few locations in the United States that is burgeoning with global health innovation and activity. Companies and institutions in the Tar Heel State are indus-

try leaders, rising to solve many global health challenges. For example, Burroughs Wellcome, one of the predecessors of GSK, whose US base of operations is in Research Triangle Park, played an influential role in the discovery of zidovudine (AZT). AZT was the first treatment for HIV infection and AIDS, and the long-standing importance of AZT in the fight against HIV/AIDS is highlighted by its continued presence on the World Health Organization's Model List of Essential Medicines [6, 7]. A ceramic water purifier created at the University of North Carolina (UNC)-Chapel Hill is another example. The purifier, which can be made by indigenous populations, has increased access to safe drinking across the world and was honored with the International Water Association's 2008 Project Innovation Award [8]. While the outcomes of these activities benefit recipient countries, such efforts also improve the health status of North Carolina's residents—supporting many of North Carolina's 2010 Health Objectives (available at: <http://www.healthy.carolinians.org/objectives/health/healthCare.aspx>)—and its economy.

The impact of the global health sector on North Carolina's economy is significant [9]. In September 2009, the Triangle Global Health Consortium (TGHC) and the Center for Strategic and International Studies (CSIS) Commission

Table 1.
US Spending on Global Health

Funded GHI sectors	Period, \$US billions	
	2003-2008	2009-2014
AIDS, tuberculosis, and malaria	22	51
Other	5	12
Total	27	63

Note. Data are from [3]. AIDS, acquired immunodeficiency syndrome; GHI, Global Health Initiative.

Lisa Hawley, MPH, Triangle Global Health Consortium.

Nicole Fouche, PhD, executive director, Triangle Global Health Consortium. She can be reached at nicole.fouche@triangleglobalhealth.org.

Willard Cates Jr, MD, MPH, president, Research, FHI; board member, Triangle Global Health Consortium.

Margaret E. Bentley, PhD, associate dean for global health and professor of nutrition, UNC Gillings School of Global Public Health; board chairperson, Triangle Global Health Consortium.

held a policy forum that highlighted the Research Triangle as a center of global health excellence, spotlighting how the region generates new knowledge, skills, jobs, and external partnerships essential to US leadership in global health. The policy forum focused on further enhancing North Carolina's strong global health sector and also informed the deliberations of the CSIS Commission on Smart Global Health Policy as it drafted its final report on creating a long-term US strategic approach to global health [10].

At the forum, the Duke Global Health Institute shared their report on the impact of the global health sector on North Carolina's economy [9]. The authors used data to quantify global health economic activity generated by North Carolina's labor market, which includes for-profit, not-for-profit, and academic sectors. The study analyzed the impact of the activities that benefit countries whose income levels are, according to the World Bank's definition, "low" or "middle-low." The measured goods and services, which included items such as pharmaceuticals, medical apparatus, diagnostic tools, and new information technologies, all promoted improved health outcomes [9]. The study showed that, in 2007, global health economic activity generated by North Carolina's labor market accounted for more than 7,000 jobs, generated \$1.7 billion for the state's economy, and provided \$18.24 million in tax revenue (Table 2) [9, 11]. The results demonstrate the beneficial impact that global health has on North Carolina's economy and the potential for continued growth.

TGHC: Shaping Global—and Local—Public Health

The TGHC was formed in 2009 to capitalize on the long legacy and rapid growth of global health activity in North Carolina. Founding member organizations include UNC-Chapel Hill, North Carolina State University, Duke University, RTI International, FHI, IntraHealth International, and the North Carolina Biotechnology Center. The global health leaders of these organizations recognized the opportunities for synergy and the associated beneficial impacts. Similar to the impetus behind the North Carolina Biotechnology Center's effort to strengthen the biotechnology industry in North Carolina, the TGHC's mission is to establish North

Carolina as an international center for research, training, education, advocacy, and business dedicated to improving the health of the world's communities. It seeks to engage academic, governmental, business, and not-for-profit organizations in this collaborative effort.

TGHC members have a global presence in most regions of the world. By combining their resources and expertise, the consortium is able to tap into a wealth of knowledge and capacity to provide global leadership. The TGHC also provides credible guidance to the public, businesses, and policymakers on important and emerging health and health infrastructure issues.

The TGHC facilitates collaboration and partnerships among professionals and institutions. In addition to serving as a clearinghouse of global health resources and information, the TGHC is larger than the sum of its parts for the mission of improving access and communication among academic, government, not-for-profit, and for-profit sectors.

The TGHC supports local colleges and universities and promotes learning opportunities for undergraduate, graduate, and professional students and faculty to become involved in service and research projects with its expanding multisectoral membership. In this way, the TGHC is enhancing North Carolina's ability to produce top-quality health professionals, educators, researchers, innovators, policymakers, and public health leaders.

During its first year, the TGHC has had many accomplishments. These achievements include bringing together North Carolina's global health constituency to engage in monthly discussions about topics at the forefront of global health; establishing an interdisciplinary graduate and professional course called One Health (which is based on the One Health Initiative [available at: <http://www.onehealthinitiative.com>] and involves the collaborative effort of multiple disciplines—working locally, nationally, and globally—to attain optimal health for people, animals, and our environment) for students at its 3 participant universities; seeding working groups in the areas of health systems strengthening, professional development and engagement, gender, and One Health; creating an opportunity for member universities to showcase their best and brightest students through an interuniversity

Table 2.
Global Health Economic Impact in 2007, by Sector and Category

Category	Sector			Total
	Not-for-profit	For-profit	Academia	
Output, \$US millions, total ^a	1041.24	591.90	50.95	1,684.09
Tax revenue, \$US millions	7.66	8.86	1.68	18.2
Labor income, \$US millions, total ^a	267.48	220.34	20.99	508.81
Jobs, no. of units, total ^a	3,496	3,064	581	7,141

Note. Data are from [9].

^aIncludes direct, indirect, and induced figures.

case competition; offering an annual career fair for students and professionals; and facilitating collaborations that have translated into 2 large grant awards. The progress thus far is a testament to the excellence of the people and organizations working in global health in the state.

With the TGHC's continued role and synergistic contributions, North Carolina has a unique opportunity to benefit from the burgeoning worldwide interest in global health. As the global public health sector continues to grow in the state, it will not only bolster North Carolina's economy, but will also improve the health and well-being of all North Carolinians.

Policy Forum Contributions

This policy forum on global health marks the first of its kind for the *NCMJ*. The selected articles represent the diverse range of contributions by North Carolinians dedicated to global health, ranging from AIDS policy to zoonotic infection control. The policy forum provides an introduction to the numerous activities in North Carolina related to global health, demonstrating the importance of this burgeoning sector to the state. A brief summary of the articles in this forum follows below.

The Women's CoOp HIV Prevention intervention, discussed in the commentary by Wechsberg and colleagues [12], is recognized by the Centers for Disease Control and Prevention as a "best-evidence" behavioral intervention to prevent HIV infection [13]. This program—implemented locally and globally by RTI International—reduces the likelihood that at-risk women will become infected with HIV.

North Carolina's fast-growing Latino population benefits from global knowledge as the lessons learned abroad about sexual and reproductive health needs are implemented locally. The commentary by Villa-Torres and colleagues [14] details aspects of the program jointly run by Ipas and El Pueblo that led to successful transfer of lessons from global activities to efforts to improve the health of the local Latino community.

The commentary by Stilwell and Nelson [15] addresses the international and local health worker shortage and activities that have been implemented to minimize the shortage. IntraHealth International shines a light on the development of evidence-based approaches and intervention strategies to strengthen global human resources for health. These approaches can be used to address North Carolina's shortage and uneven distribution of health workers, particularly in eastern counties.

Human health and animal and environmental health are interconnected. The commentary by Slenning [16] elucidates the human-animal-environmental health link through examples in ecosystem health, direct human and animal effects, and emerging and re-emerging diseases and the connection under the One Health Initiative.

The commentary by Skuster and Wolf [17] discusses the controversial Helms Amendment, introduced by the late

North Carolina Senator Jessie Helms, that bans all US foreign aid for abortion. Ipas demonstrates how this policy has a negative public health impact on maternal mortality, both locally and globally.

Aflatoxin types B₁, B₂, G₁, and G₂ are among the most potent chemical carcinogens. As discussed in the commentary by Selim [18], human exposure occurs directly through consumption of contaminated diets (eg, cereals, nuts, and dried fruits and vegetables) and indirectly through consumption of animal products (eg, meat, milk, poultry, and eggs). East Carolina University is engaged in research related to the direct and indirect human exposures to the aflatoxin types that impact farmers in North Carolina.

North Carolina has long been regarded as a leading hub for research, innovation, policy, and service. This distinction can be credited, in part, to its efforts to discover, develop, promote, and "produce" global health. Global health has become a considerable driver of economic activity in North Carolina. Measurement of these impacts was the primary objective of the study conducted by the Duke Global Health Institute [9], which is reviewed in the commentary by Page and colleagues [11].

Global health policy is in a state of profound transition. As this transition takes place, North Carolina will be faced with challenges and opportunities as governmental, nongovernmental, academic, and private-sector actors shape—and are shaped by—this changing landscape. The commentary by Meier and Brugh [19] addresses the role of the United States in global health policy and analyzes the paths through which this role impacts North Carolina.

Lower-cost clinical trials, which are needed for drug and vaccine development, are successfully implemented outside of the United States but have huge implications for North Carolinians. For example, as McKee and Cohen [20] point out in their commentary, in Sub-Saharan Africa Quintiles has successfully conducted studies of experimental drugs and vaccines for HIV infection, tuberculosis, and malaria. Each of these studies has the potential to drastically improve the lives of people—locally and globally—affected by these illnesses.

A critical element to strengthening health systems is the development of an adequate health workforce. The commentary by Masselink [21] describes the connection between North Carolina and the international health care worker shortages. It also discusses the ethical dilemma of recruiting health care workers from resource-poor countries and questions the roles and responsibility of the United States when considering recruitment from these settings.

Despite significant scientific advances, hunger and lack of nutrition still remain important issues worldwide. Through his commentary, Gessner [22] introduces the North Carolina Research Campus, which aims to apply an integrated systems biology approach to the development of tomorrow's healthier, more nutritional foods; improved lifestyle behavior; and targeted therapeutics.

Recently, many international institutions have committed to implementing a baby-friendly hospital initiative. In their commentary, Labbok and Taylor [23] review how the Carolina Global Breastfeeding Institute (CGBI) has facilitated activities to secure the commitments from these international entities, as well as how the CGBI works with local institutions and specific populations, such as physicians and teen mothers, to create a breastfeeding-friendly environment.

North Carolina is experiencing major in-migration of Latinos. The Latino Health Coalition (LHC), discussed in the commentary by Caplan and Smith [24], facilitates the education of North Carolina health care workers in culturally appropriate care, through immersion training. During this training, workers travel to, and provide health care services in, Latino countries. The LHC has taken more than 8,000 North Carolinians abroad to 48 different countries. A survey of program participants revealed that half made at least 3 changes in their professional areas.

The commentary by Bentley and Van Vliet [25] defines global health and explains why global health is local public health. It provides a variety of examples from programs initiated at UNC-Chapel Hill of how global solutions developed in North Carolina impact the health of individuals around the world and how innovations developed in resource-constrained settings provide solutions for the health of citizens in North Carolina.

The ability of global health to thrive depends on voters' awareness of the issues. In her commentary, Hoban describes her experience as the recipient of a grant from

the UNC Gillings School of Global Public Health, which allowed her to "take a closer look at the global health activities of North Carolinians and institutions based in the state" [26p488]. These activities fall under one of two headings: projects that benefitted populations in Malawi and/or Zambia, and activities implemented in developing countries that influence US public health. Her experience was shared with the local Triangle community through a radio broadcast series called Global Health Connections, which aired on WUNC.

The results of the CAPRISA 004 study have invigorated the world of HIV infection prevention. FHI and UNC provided technical assistance to South Africa's lead investigators that was crucial for achieving the successful outcomes of this study [27]. The commentary by Cates and Kashuba [28] highlights this groundbreaking topical-antiretroviral intervention, which provides women all over the world with a promising tool to help protect against infection with HIV and herpes simplex virus.

The variety of global health topics showcased in this issue highlight only a fraction of the public health activity and expertise in North Carolina. The combination of increased funding for global health and the constellation of diverse local industries, leadership, and expertise make North Carolina's potential contributions to global health limitless. The TGHC engages various sectors—through research, business, advocacy, training, and education—to maximize their efforts in improving health around the world, with a net beneficial impact on North Carolina's economy and the health of its residents. **NCMJ**

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