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# NCMJ

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## International Health Initiatives in North Carolina



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# Tar Heel Footprints in Health Care

*Recognizing individuals whose efforts—often unsung—are improving the quality and accessibility of health care*

## Anthony Charles, MD



Anthony Charles was practically born to be a great surgeon. His father, a pediatrician, operated a hospital in Lagos, Nigeria, and dreamed that all of his children would become physicians in different specialties and work at the hospital. Although this dream did not become reality, his son Anthony has become a first-rate surgeon who improves the health and well-being of people around the world.

Charles is an assistant professor in the Department of Surgery at the University of North Carolina (UNC) School of Medicine. He excels in this role and serves as a medical practitioner, mentor, and teacher to many people. "Dr. Charles is very dedicated to any project he's involved in," said Adesola Akinkuotu, a former student and co-investigator of Charles and current surgical resident at Johns Hopkins Hospital. "Dr. Charles is very passionate about education, which makes him a great person for his position."

Charles is spreading his passion for education near and far. UNC has a long-standing partnership with Malawi. While getting his masters in public health at the UNC Gillings School of Global Public Health, Charles was invited to Malawi to see one of the projects involving human immunodeficiency virus. During his visit, Charles observed that the trauma burden was substantial, that the availability of surgical services could not keep up with demand, and, in particular, that there was a need for surgical education in Malawi. With 14 million people, Malawi has only 25 trained surgeons; few of the surgeons are Malawians, and none worked in the hospital he visited.

Since that first visit, Charles and a team of surgeons and students from UNC have periodically visited Kamuzu Central Hospital in Lilongwe, Malawi, to provide surgical services, conduct training, and perform research through the Malawi Surgical Initiative, a program affiliated with UNC Project-Malawi (available at: <http://www.med.unc.edu/infdis/malawi>). Although the initiative had a sustained presence in Lilongwe, the team realized that training Malawians as surgeons would be a more effective public health project. With that idea in mind, Charles spearheaded the effort to create the Malawi surgical residency program, with the intention that Malawian surgeons take over the program's administrative and training responsibilities after 5 years. The program is now training 8 residents, and the first group will finish in 2014.

A man of many talents, Charles enjoys politics and interacting with local and international government officials, which enhances his effectiveness in persuading others to support his novel ideas. According to Clara Lee, director of research, assistant professor of surgery in the Division of Plastic and Reconstructive Surgery at UNC Hospital, and colleague of Charles on the Malawi Surgical Initiative, "Anthony is the person who holds the Malawi Surgical Initiative together and keeps pushing it forward." Charles is not only a compelling communicator, he is also a very capable physician. Gift Mulima, one of the residents in the inaugural class of the Malawi Residency Program, reflected that Charles "is smart and gets things done and done the right way. He makes sound decisions. You should see him in the operating room!" Lee summarized Charles' character by noting that "he has talents in so many areas, so he is able to keep many things going at once. He is the guy who comes out of the operating room after a trauma laparotomy, walks

*continued on page 406*



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down the hall to smooth out some administrative issues with the hospital staff, turns the corner to teach the Malawi surgery residents, and then goes back to the office and analyzes our study data on his laptop. And somehow he does all of that with a smile, or even a laugh. He is always laughing, which is really telling. I think he finds great joy in helping people. It's one of the best things about working with him. We are all energized by his joy."

Charles was born in Germany, grew up in Nigeria, studied in England, and currently works in North Carolina and Malawi. If there is anyone who understands the complex relationship between global health and local health, it is he. When asked to compare these places, he noted that, in each setting, many professionals on the frontlines of medical care are overwhelmingly frustrated and that there is often a divide between administrators and direct care professionals. However, Charles recognizes that much can be done in the developing world, even with little funding, and he sees how much gratitude the patients and families express, particularly for surgical care that would otherwise have been unavailable.

One of Charles' hobbies is to collect African proverbs, a favorite of which is "Sometimes in life, you must stoop to conquer." He has taken this proverb to heart. By confronting challenges such as uncertain funding and frequent changes in government administration, he has helped Malawi move toward a solution to a seemingly unsolvable problem. He has also inspired a new generation of surgeons in Malawi. As Mulima stated, "We are the pioneers of this program. Being young blood, we have the future of the program in our hands."

*Contributed by Anna Bauer, graduate student, Department of Maternal and Child Health,  
UNC Gillings School of Global Public Health.*



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# Secondhand Smoke Policies at State and County Fairs

Caroline Mage, Adam O. Goldstein, Siobhan Colgan, Bron Skinner, Kathryn D. Kramer, Julea Steiner, Ann H. Staples

## Abstract

**Objectives:** We sought to assess the smoking policies at state and county fairs in North Carolina.

**Methods:** We contacted North Carolina fair managers by telephone to solicit participation in a survey that assessed the extent to which fairs have written policies about smoking and secondhand smoke (SHS) exposure, managers' beliefs concerning the health risks associated with SHS exposure, and specific reasons that might prompt managers to adopt smoke-free policies.

**Results:** Attempts were made to contact 47 fair managers, and 31 (66.0%) participated in the study. We found that although almost two-thirds of fairs prohibited smoking indoors, the vast majority (83.9%) had no limits on outdoor smoking. Most fair managers (84.6%) acknowledged that SHS may cause lung cancer, and a majority (51.6%) reported a belief that their patrons would largely be supportive of a more restrictive policy.

**Limitations:** Fair managers' responses were primarily based on their own opinions, estimates, and attitudes.

**Conclusions:** Because of the high number and density of fair patrons, unrestricted outdoor smoking likely exposes most patrons to SHS. Action to eliminate all exposure to SHS at state and county fairs is needed.

**Keywords:** policy; secondhand smoke; state fair; tobacco

Secondhand smoke (SHS) exposure causes thousands of pulmonary and cardiac deaths and diseases in the United States annually [1]. A 2006 report by the US surgeon general indicates that even short-term exposure to SHS has serious adverse effects, increasing the risk of a heart attack [2]. The *only* protection from the health effects of SHS is the implementation of smoke-free policies [2].

Evidence exists that outdoor exposure to SHS may have health risks similar to those of indoor SHS exposure, particularly in environments where many people congregate and/or physical barriers limit ventilation [3-5]. A few states, such as California and Minnesota, have implemented smoking bans in public outdoor spaces, including beaches and parks owned by the city [6, 7].

State and county fairs are outdoor public places drawing tens of millions of visitors each year. Fair patrons are at particular risk for exposure to SHS because of the large

number and high density of visitors, limited ventilation in physical structures, and higher-than-average smoking rates among blue-collar fair employees [8]. No prior research has examined whether fairs have policies regulating SHS exposure. North Carolina law prohibits smoking in some public indoor areas. However, this law does not apply to outdoor venues.

North Carolina's outdoor fairs attract a total of 3 million visitors annually, which is approximately one-third of the state's population [9]. This study explores the smoking and SHS policies at fairgrounds throughout North Carolina.

## Methods

**Sample.** The target sample included managers for all types of fairs in North Carolina, representing county and community agricultural fairs, as well as the state fair in Raleigh. The Web site of the North Carolina Association of Agricultural

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Fairs provided a list of North Carolina fairs in 2006 (available at: <http://www.ncagfairs.org>). When a nonprofit organization operated the fair, the research team contacted the responsible organization to determine the appropriate survey respondent. Many fair Web sites provided contact information for fair managers. Otherwise, contact information came from local chambers of commerce or from city and county managers' offices.

**Questionnaire.** The research team contacted fair managers by telephone to solicit participation in a survey (Appendix, available only in the online edition of the *NCMJ*). Survey questions assessed written policies on smoking, barriers to adoption of smoke-free fair policies, and beliefs concerning SHS exposure risks. Respondents estimated the percentage of employees who, while working, smoke. For fairs that allowed smoking outdoors, respondents estimated the percentage of patrons who smoke. Fair managers were also asked about their agreement with a variety of factors that might prompt their fair to adopt a 100% smoke-free policy (eg, "required by law," "complaints from nonsmoking patrons," and "petition from patrons"). The survey included questions about policies related to alcohol for comparison purposes, and respondents were given the opportunity to provide comments.

Interviews occurred during May and June 2006. The project received approval by the institutional review board at the University of North Carolina School of Medicine.

**Analysis.** Two researchers double-checked and entered all data. Statistical analysis was performed using SPSS, version 12.0 (SPSS). Analyses were descriptive and primarily exploratory in nature. Analyses included frequency tabulations and measurements of associations between respondents' demographic characteristics and policy outcomes.

## Results

**Sample characteristics.** A total of 47 fairs existed during 2006 in North Carolina, and managers of 31 (66.0%) agreed to be interviewed. The remaining 16 managers did not respond to requests for participation. Researchers attempted to contact nonrespondents at least 10 times.

Respondents to the survey were predominantly male (89.9%) and nonsmokers (93.5%), with a mean age of 60.2 years (range, 26-83 years). The mean duration of existence among the fairs was 58.9 years (range, 6-153 years). Approximately half (48.4%) of the fairs still had an agricultural exhibit featuring tobacco during the previous fair season. During the operating season of each fair, the mean weekly attendance was 70,529 people (range, 4,500-800,000 people). Fair managers estimated that 43.6% (range, 15%-80%) of fair attendees were younger than 18 years of age.

Fair managers estimated that 25.9% (range, 5%-80%) of their patrons smoked.

Respondents also estimated that 15.8% (range, 0%-50%) of the previous season's employees smoked.

**Written policies on smoking and alcohol use.** Although 80.6% of fair managers said that their fairs had written policies on alcohol, only 61.3% managed fairs with written policies on smoking. Five fair managers (16.1%) reported that tobacco was sold at their fair, and no managers reported that alcohol was sold (Table 1).

**SHS policies.** Twenty-six fair managers (86.6%) reported that their fairs allowed smoking in all outdoor areas (Table 2). Although a majority (63.3%) of fair managers reported that their fairs had a policy prohibiting smoking in indoor areas, 7 (23.3%) reported that their fairs had no limits on smoking or SHS exposure indoors or outdoors. Three fair managers (10.0%) reported limiting smoking outdoors to designated smoking areas and prohibiting smoking indoors. One fair manager (3.3%) reported that their fair was 100% smoke-free. No correlation existed between fair size (defined as the mean weekly number of attendees) and presence or absence of a policy about smoking ( $P = .175$ ).

**Beliefs about SHS.** The great majority of respondents agreed or strongly agreed that SHS may cause lung cancer (84.6% of managers) and that SHS may cause heart disease (76.9%). The majority agreed or strongly agreed that SHS exposure should be eliminated or restricted (64.3% of managers) and that fair visitors would support such a policy (66.7%). Most managers (58.1%) also indicated that exposure to other people's cigarette smoke should be eliminated entirely or confined to areas with ventilation. Approximately half of respondents (51.6%) agreed that the majority of their fair patrons would be supportive of a policy that eliminated SHS exposure or limited it to a separate area.

**Factors influencing policy change.** Fair managers were asked to indicate the most important reason that the fair did not have a 100% smoke-free policy. The reason most frequently reported (by 38.7% of managers) was that the fair was outside. When prompted for additional reasons that might cause the fair to become 100% smoke-free, fair managers agreed that the following factors might lead to stronger indoor and outdoor smoke-free policies: petition from patrons (64.5% of managers), petition(s) from school children (61.3%), and complaints from nonsmoking patrons (61.3%).

**Table 1.**  
**Alcohol and Tobacco Policies at North Carolina Fairs**

Policy	Response, no. (%) of managers (N=31)	
	Yes	No
Written policy on smoking	19 (61.3)	12 (38.7)
Tobacco for sale	5 (16.1)	26 (83.9)
Written policy on alcohol	25 (80.6)	6 (19.4)
Alcohol for sale	0	31 (100)

**Table 2.**  
**Smoking Policies at North Carolina Fairs**

<b>Policy</b>	<b>No. (%) of managers (N=30)</b>
100% smoke-free	1 (3.3)
Smoking allowed outdoors, not indoors	19 (63.3)
Smoking areas outdoors, not indoors	3 (10.0)
No limits on smoking	7 (23.3)

## Discussion

Limitations on SHS exposure in many outdoor environments are increasing [10-13]. In North Carolina, a tobacco-free schools movement resulted in all school-district grounds becoming smoke-free [10]. Colleges and hospitals have adopted smoke-free campus policies [11, 12], outdoor stadiums with a high density of patrons frequently prohibit smoking [13], and parks, beaches, and other outdoor environments have begun to implement smoke-free policies [6, 7]. Interest in eliminating outdoor exposure to SHS at fairgrounds appears to be increasing; fairs in Colorado, Kentucky, and Arkansas have prohibited smoking inside buildings on the fairgrounds [14-16]. North Carolina's recent smoke-free law, implemented in January 2010, should require all indoor areas at fairs to be smoke-free if food is served in these areas. Broad public support for this indoor-air law should help fair managers reassess the outdoor smoking policies at their fairs.

Most North Carolina fair managers acknowledge the health hazards of SHS, personally support eliminating or restricting SHS, and believe their patrons would also support greater restrictions. However, current policies do not reflect these perceptions and beliefs. Results also suggest that fair managers (and other community leaders) need to hear from the community in support of such policy change, through petitions, complaints about current SHS exposure, and positive recognition of expanding smoke-free policies. Although it is also possible that the fair managers interviewed may not

have the authority to implement smoke-free policies, their perceptions have face validity for what it would probably take, in the absence of legislation, to influence the change to a smoke-free policy at future fairs. Although we hypothesized that a historic economic dependence on tobacco in North Carolina would make fair managers reticent to consider tobacco-free policies, our results do not support this hypothesis, as the majority of participants in this study appear to be supportive of such policies.

A majority of the North Carolina fairs also have a written policy limiting SHS exposure indoors, but such policies are inadequate. Almost one-fourth have no restrictions on smoking, and only one has completely eliminated exposure by adopting a 100% tobacco-free policy. The majority allow smoking outdoors, thus exposing most fair attendees and employees to SHS for the duration of their stay. As evidence mounts that outdoor exposure to SHS has health risks similar to those of indoor exposure, it becomes imperative that outdoor recreational venues such as fairs implement more-comprehensive tobacco policies [3-6].

Although this study is intended to provide an initial look at the existing tobacco policies among North Carolina fairs and at the attitudes and opinions of the managers of these fairs, several limitations exist. One is that fair managers' responses were based on their own opinions and attitudes. However, results demonstrated that these managers were knowledgeable about the health risks of SHS and knew their fairs' policies. Although we did not use a previously validated questionnaire because of the specific topic and population of the study, we used an original questionnaire that was based on input from a number of tobacco and health researchers. Finally, this survey was conducted several years ago. Additional research is now needed to measure levels of SHS at fairs to document the exposure to both employees and fair patrons. In fairs implementing a smoke-free policy, data outlining the benefit of policy change and consumer support will be useful in supporting the argument for tobacco-free policies in these environments. NCMJ

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# Drive-Time Proximity to Joint Commission Primary Stroke Centers Among North Carolina Residents Who Died of Stroke

Andrew W. Asimos, Dianne Enright, Sara L. Huston, Laurie H. Mettam

## Abstract

**Objective:** In developing a statewide system of stroke care, understanding the relative availability of acute stroke care at designated centers for stroke care is essential. In this article, we compare the change in availability of acute stroke care in North Carolina at Joint Commission Primary Stroke Centers (JCPSCs) between 2006 and 2008 by examining the drive-time proximity of the residential address to the nearest JCPSC among people who died of stroke.

**Methods:** We assigned geographic coordinates to residential addresses of North Carolinians who died of stroke and to addresses of North Carolina JCPSCs. We calculated the distance within a 40-minute drive from each JCPSC and determined whether the residential addresses of patients who died of stroke were in the areas demarcated by the drive time. In a secondary analysis, we included non-JCPSCs that participate in recognized quality-improvement programs for stroke care.

**Results:** In 2006, 37% of geocodable residences of patients who died of stroke (3,834 of 10,469) were within a 40-minute drive from a JCPSC. By the end of 2008, this percentage increased to 56% (3,482 of 6,204). Inclusion of other hospitals that participate in recognized quality-improvement programs for acute stroke care increased the 40-minute drive-time coverage to 82% (5,095 of 6,204).

**Limitations:** As an index of the geographic distribution of the stroke burden, we used deaths due to stroke, rather incident strokes. We included several assumptions in our drive-time calculation.

**Conclusions:** For many regions of North Carolina in which the stroke burden is high, timely care at JCPSCs for acute stroke is unavailable. To develop a statewide system for acute stroke care in North Carolina, criteria beyond JCPSC certification should be considered for designating hospitals as centers for stroke care.

**Keywords:** ambulance; stroke; public policy

To create statewide systems for acute stroke care, several states are pursuing legislative, health department, or emergency medical services initiatives that designate hospitals as stroke centers [1-8]. These initiatives are based on data indicating that acute stroke care improves once a hospital meets criteria for designation as a center for stroke care. For example, stroke center designation in New York state was associated with shorter door-to-treatment times, greater use of intravenous tissue plasminogen activator (tPA), and fewer tPA treatment protocol violations [9], and in a community hospital in Maryland the proportion of

patients with ischemic stroke who received tPA increased after the hospital was designated as a stroke center [10]. Coupled with many of these stroke center designation initiatives are protocols for emergency medical services professionals to route patients within prespecified intervals to stroke centers, bypassing nondesignated hospitals [3, 8, 11]. Implicit in such initiatives is that patients with acute stroke will be afforded the best opportunity to receive time-sensitive treatment for acute stroke by being preferentially taken to stroke centers. Indeed, the sooner tPA is given to a patient with ischemic stroke, the greater the benefit, especially

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when treatment is started within 90 minutes after the initial stroke [12, 13]. For hemorrhagic strokes, timely availability of emergency care is also important, since substantial early hemorrhage growth occurs in roughly a quarter of patients within 1 hour after stroke and is an independent determinant of both mortality and functional outcome [14]. As an example, treatment for anticoagulation reversal in patients with warfarin-related hemorrhagic strokes is a demonstrated time-sensitive therapeutic strategy that has the potential to limit early hemorrhage growth [15].

In 2006, the North Carolina General Assembly ratified House Bill 1860, which established a stroke advisory council to provide guidance on the development of a statewide system of stroke care, including a system to identify primary stroke centers and disseminate information about their location [16]. Joint Commission Primary Stroke Center (JCPSC) certification is the only established and recognized program in North Carolina for designating stroke centers. Established in 2003 in response to recommendations from the Brain Attack Coalition and the American Stroke Association [17], JCPSC certification requires that hospitals demonstrate compliance with standards for stroke care, including standardized methods for delivering clinical care that are based on appropriate clinical guidelines or evidence-based practice and commitments to measuring performance and improving care. In addition to the JCPSC program, 2 other organized quality-improvement programs for stroke care exist among North Carolina hospitals: the Paul Coverdell National Acute Stroke Registry (PCNASR) and the Get With The Guidelines-Stroke (GWTG-S) program. The PCNASR is funded by the Centers for Disease Control and Prevention and collaboratively implemented by the North Carolina Heart Disease & Stroke Prevention Branch and the University of North Carolina at Chapel Hill Department of Epidemiology [18]; the GWTG-S program is managed by the American Stroke Association [19]. Participation in these programs suggests that a hospital is committed to improving all aspects of stroke care, including treatment of acute stroke, since these programs evaluate implementation of treatment guidelines by tracking performance measures identical to those tracked by JCPSCs (Table 1). Furthermore, participation in the PCNASR and the GWTG-S program is associated with improved performance in some of these areas [20-22]. However, these 2 programs are not rigorously evaluated by an independent certifying body such as the Joint Commission, which conducts on-site inspection of JCPSCs every 2 years.

Quality stroke care requires expeditious treatment, but several impediments exist. Previous studies have described delayed presentation to the hospital among patients with lack of

awareness of stroke signs and symptoms, reluctance to call emergency services (eg, 911), and absence of a bystander for acute stroke events [23-30]. Additionally, critical time can be lost after a patient has arrived at the hospital, owing to administrative delays, competing emergent events, and the overall patient volume in the emergency department [31]. The focus of this study involves another critical component in the stroke chain of survival—the potential for expeditious ground transport to hospitals capable of administering high-quality care for acute stroke [32]. It is well documented that, as the interval between the acute stroke event and arrival at a stroke center increases, the delay in receipt of time-sensitive treatments increases and the likelihood of a clinical benefit from treatment decreases [12, 13, 33, 34]. Therefore, a crucial aspect of a statewide system of stroke care involves understanding the geographic distribution of designated stroke centers relative to the location of patients with acute stroke. As an example, in Georgia, stroke mortality was 20% lower among populations living within a 20-mile radius of a stroke-ready hospital [35].

Immediately after the passage of House Bill 1860, 10 JCPSCs existed in North Carolina, whereas at the end of 2008, there were 22 JCPSCs. In this article, we compared the change in relative availability of acute stroke care in North Carolina between 2006 and 2008 by examining the drive-time proximity of residential addresses of patients who died of stroke to the nearest JCPSC. In a secondary analysis, for areas underserved by JCPSCs, we evaluated drive times to hospitals participating in the PCNASR and the GWTG-S program. These institutions represent logical additions to the network for acute stroke care because of demonstrated improvement in stroke care with participation in the PCNASR and/or the GWTG-S program.

**Table 1.**  
**Standardized Performance Measures Common Among North Carolina Hospitals Providing Stroke Care**

<b>Performance measure</b>
Provide venous thromboembolism prophylaxis
Provide/continue antithrombotic therapy at hospital discharge
Provide anticoagulation therapy for atrial fibrillation or flutter
Provide thrombolytic therapy
Provide antithrombotic therapy by the end of day 2 of hospitalization
Provide/continue statin therapy at hospital discharge
Screen for dysphagia
Provide stroke education
Refer to a smoking-cessation program
Assess for rehabilitation needs

Note. Hospitals consist of Joint Commission Primary Stroke Centers and those in recognized quality-improvement programs for stroke care (ie, the Paul Coverdell National Acute Stroke Registry and the Get With The Guidelines-Stroke program).



## Methods

We conducted a drive-time analysis to stroke centers for 2006 and 2008. We used ArcGIS 9.2 software (Esri) to assign geographic coordinates to the residential addresses of patients who died of stroke and the address of JCPSCs, using various sources of local and state Department of Transportation street centerline data. We defined North Carolina deaths due to stroke as those for which the underlying cause of death on the death certificate was coded with any of the following *International Classification of Diseases, Tenth Revision* codes: I61 (ie, intracerebral hemorrhage), I63 (ie, cerebral infarction), and I64 (ie, stroke, not specified as hemorrhage or infarction) [36]. We chose residential addresses of patients who died of stroke because these data provide a precise geographic representation of one index of the stroke burden across the state. Although we recognize that use of the number of incident strokes during the periods studied would have been preferable, such data can only be geocoded at the county level. For the 2006 analysis, we geocoded the residential addresses of people in North Carolina who died of stroke during 2003-2005, along with the addresses of the 10 JCPSCs that, according to the Joint Commission [36], were in North Carolina during 2006. For the 2008 analysis, we geocoded the residential addresses of people in North Carolina who died of stroke during 2006-2007, along with the addresses of the 22 North Carolina JCPSCs that, according to the Joint Commission [36], were in North Carolina at the end of 2008. We did not require institutional review board approval for use of the data in this study because deaths are in the public record in North Carolina and because the addresses of JCPSCs and of hospitals in the PCNASR and/or the GWTG-S program were made available to us by the agencies sponsoring those programs.

We calculated the distance within 40-minute drives from hospitals of interest, using ArcGIS Network Analyst and North Carolina Department of Transportation Integrated Statewide Road Network (ISRN) source data. ISRN data are attributed with one-way streets, numbers of lanes, and speed limits. By using network analysis, drive-time estimates can be accurately computed. For example, a greater distance can be traveled along an interstate highway at a speed of 65 miles/hour than on a neighborhood road at a speed of 35 miles/hour. We created 40-minute drive-time polygons around each JCPSC. We chose a 40-minute drive time for our analysis because of limitations in the methods we used to calculate drive times, as well as practical considerations. Our goal was to consider a 30-minute

drive time based on ambulance-response speeds. However, because our software assumed that ambulances traveled at the speed limit and that each left-hand turn added 5 seconds to the drive time, we extended the drive time to 40 minutes to adjust for these limitations. Although it is difficult to calculate a definitive adjustment in drive time to account for the speed traveled by ambulances (which is 10-15 miles/hour greater than the speed limit), our adjustment represents an acceptable modification. We chose the

**Table 2.**  
**Characteristics of Patients With Geocodable Residences Who Died of Stroke**

Variable	Patients, no. (%), by year of death <sup>a</sup>	
	2003-2005 (N = 10,469)	2006-2007 (N = 6,204)
Stroke type <sup>b</sup>		
Ischemic	1,060 (10)	489 (8)
Hemorrhagic	1,906 (18)	1,141 (18)
Unspecified	7,503 (72)	4,574 (74)
Age, years		
<40	86 (1)	55 (1)
40-49	274 (3)	146 (2)
50-64	1,012 (10)	667 (11)
≥65	9,097 (87)	5,336 (86)
Sex <sup>c</sup>		
Female	6,395 (61)	3,731 (60)
Male	4,074 (39)	2,472 (40)
Race		
African American	2,365 (23)	1,393 (22)
White	7,971 (76)	4,727 (76)
Other	133 (1)	84 (1)
Education level <sup>d</sup>		
Less than high school	5,005 (48)	2,688 (43)
High school graduate	2,812 (27)	1,816 (29)
More than high school	2,652 (25)	1,560 (25)

Note. A total of 10,689 patients died of stroke during 2003-2005, and 6,393 died of stroke during 2006-2007.

<sup>a</sup>Data for 2003-2005 were used in analysis of the 2006 study period involving 10 Joint Commission Primary Stroke Centers (JCPSCs), and data for 2006-2007 were used in analysis of the 2008 study period involving 22 JCPSCs.

<sup>b</sup>Defined on the basis of *International Classification of Diseases, Tenth Revision* codes for ischemic stroke (I63), hemorrhagic stroke (I61), and stroke, not specified as hemorrhage or infarction (I64).

<sup>c</sup>The sex of 1 patient who died during 2006-2007 was unavailable.

<sup>d</sup>Data are for patients aged ≥25 years. The education level was unavailable for 140 patients who died during 2006-2007 (13 patients were aged <25 years, and 127 patients had an unknown education level).

**Figure 1.**  
**Proximity of Patients Who Died of Stroke to Hospitals Confirmed to Be Joint Commission Primary Stroke Centers (JCPSCs) in 2006**

This figure is available in its entirety in the online edition of the *NCMJ*.

Note. Triangles denote geocoded residential addresses of patients who died during 2003-2005. Color-shaded areas denote 40-minute drive-time service areas of JCPSCs.

30-minute threshold because other states have incorporated this value into their destination-bypass protocols [8] and because it is practical. For example, it has been demonstrated that patients who arrive at the hospital within 60 minutes after symptom onset receive thrombolytic therapy earlier and more frequently than those who arrived later [34], and a 30-minute drive time allows an additional 30 minutes for recognition of stroke symptoms and activation of the 911 system. Furthermore, it is impractical to expect that personal vehicles or ambulances will, after a 30-minute drive, continue bypassing hospitals in favor of a JCPSC, and that drive times exceeding 30 minutes will not yield delays in tPA initiation that might counterbalance this treatment's beneficial effect.

To estimate how many patients died of stroke within and beyond a 40-minute drive from JCPSCs in the state, we used point-in-polygon (PIP) analysis. PIP analysis is a geospatial tool commonly used and well suited for our drive-time investigation [37, 38]. The analysis involves an overlay of points and an area or polygon that defines the distance within the given drive time from the destination of interest. In our primary analysis, the points denote the residential addresses of patients who died of stroke, and the polygons define the distance within 40-minute drives from JCPSCs. By using PIP analysis (also known as a "spatial join"), the number of residential addresses in the 40-minute drive-time service area can be calculated. For both study periods, we compared the percentage of patients who resided within a 40-minute drive and died of stroke. In a secondary analysis involving regions of North Carolina outside the 2008 40-minute drive-time polygons, we geocoded addresses of hospitals that were not certified as JCPSCs (as of the end of 2008) but participated in the PCNASR or GWTG-S quality-improvement programs for stroke care. We calculated the additional potential access to acute stroke care provided by these hospitals, using the same methods described above.

## Results

For the 2006 analysis, we identified 10,689 patients who died of stroke during 2003-2005, and residential addresses for 98% (10,469) could be geocoded. In the 2008 analysis, residential addresses for 6,204 (97%) of 6,393 patients who died of stroke during 2006-2007 could be geocoded.

As demonstrated in Table 2, patient characteristics between the 2 periods were similar. Figures 1 and 2, available only in the online edition of the *NCMJ*, depict the locations of the JCPSCs, the drive-time service areas, and the residences of patients who died of stroke. Table 3 lists the percentages of death due to stroke that occurred among patients who resided within the 40-minute drive-time service areas for both study periods. In 2006, geocodable addresses for 37% of patients who died of stroke were within a 40-minute drive from a JCPSC, whereas by the end of 2008, 56% were within a 40-minute drive (Table 3 and Figures 1 and 2). In 2006, 19% of patients who died of stroke (1,941 of 10,469) lived within a 40-minute drive from more than 1 JCPSC, whereas by the end of 2008 that percentage had doubled to 38% (2,357 of 6,204). Figure 3, available only in the online edition of the *NCMJ*, shows the additional drive-time coverage afforded by including hospitals from the PCNASR and the GWTG-S program in the network for acute stroke care that was in place at the end 2008. Of the geocodable residences of patients who died of stroke during 2006-2007, a total of 82% (5,095 of 6,204) were within a 40-minute drive from JCPSCs or hospitals in the PCNASR or the GWTG-S program.

## Discussion

Intravenous tPA is currently approved by the US Food and Drug Administration for use within 3 hours after onset of stroke symptoms. However, it is well-known that the sooner tPA is given to patients with stroke, the greater the benefit, especially if treatment is started within 90 minutes after symptom onset [12, 13, 33]. For acute ischemic strokes, the benefit of thrombolytic therapy is highly dependent on the time at which it is initiated, with every 10-minute delay in tPA delivery resulting in 1 fewer patient realizing an improved outcome [33]. Furthermore, a recent study concluded that patients who arrived at the hospital within 60 minutes after symptom onset received thrombolytic therapy earlier and more frequently than did those who arrived later [34]. Unfortunately, the same investigators found that only 12% of patients with ischemic stroke presented to the hospital within 1 hour after the documented time of stroke onset [34]. Similarly, for warfarin-related hemorrhagic strokes, every 30-minute delay in administering the first dose of fresh-frozen plasma is associated with a

**Figure 2.**  
**Proximity of Patients Who Died of Stroke to Hospitals Confirmed to Be Joint Commission Primary Stroke Centers (JCPSCs) in 2008**

This figure is available in its entirety in the online edition of the *NCMJ*.

Note. Triangles denote geocoded residential addresses of patients who died during 2006-2007. Color-shaded areas denote 40-minute drive-time service areas of JCPSCs.

20% decrease in the odds of international normalized ratio reversal within 24 hours. Although public education efforts may increase the percentage of patients who seek medical care promptly after stroke symptom onset, a critical component of obtaining acute stroke care involves timely transport to a stroke center or hospital otherwise capable of managing acute stroke in accordance with the latest established guidelines.

Our analysis found that although the number of JCPSCs in North Carolina more than doubled between 2005 and 2008, a considerable percentage of patients who died of stroke during 2008 resided outside of the 40-minute drive-time polygons of JCPSCs. This is largely because the majority of JCPSCs were added in the center of the state, which is not necessarily surprising because market forces and a hospital's interest, rather than geographic need, are among the driving forces for seeking JCPSC certification. It is important to note, however, that our results should not be interpreted to imply that the locations of JCPSCs directly contributed to stroke mortality, because deaths from stroke were only used as an index of the geographic distribution of the stroke burden across the state. Our work does suggest that North Carolina cannot rely on a statewide system of acute stroke care exclusively designed around the use of JCPSCs as the destination for patients with presumed acute stroke. Indeed, several other states have reached this same conclusion and have implemented processes in addition to JCPSC certification for designating centers for stroke care [3, 5-8]. Establishment of an additional "acute stroke center" designation on the basis of evidence-based criteria that complement the existing JCPSC criteria would enhance acute stroke care in North Carolina by recognizing the vital role played by smaller hospitals in treating patients with acute stroke, especially in rural areas. Such criteria were recom-

**Figure 3.**  
**Proximity of Patients Who Died of Stroke to Hospitals Confirmed to Provide Stroke Care in 2008**

This figure is available in its entirety in the online edition of the *NCMJ*.

Note. Triangles denote geocoded residential addresses of patients who died of stroke during 2006-2007. Color-shaded areas denote 40-minute drive-time service areas of hospitals. GWTG-S, Get With The Guidelines-Stroke; JCPSC, Joint Commission Primary Stroke Center; PCNASR, Paul Coverdell National Acute Stroke Registry.

mended in 2008 by the American Stroke Association and are listed in Table 4 [39]. Our analysis suggests that non-JCPSCs participating in the PCNASR and the GWTG-S program are relatively well dispersed geographically across the state and are logical first targets for such criteria, especially because data demonstrate that participation in the PCNASR and the GWTG-S program is associated with improvements in important measures of stroke care [20-22]. However, it should be emphasized that criteria fulfillment would likely be best verified by an onsite inspection process because use of remote survey techniques for self-reporting stroke treatment capability may be unreliable [40].

Our analysis has several limitations. First, the correlation between the residential address of patients who died of stroke and the location of the stroke event is unknown. As an alternative, the proportion of the population living within 40-minute drives could have been analyzed, but this does not allow for precise geocoding and relies on aerial interpolation to estimate the total population residing within the drive time. Of note, we participated in such an analysis, which involved the tristate region of North Carolina, South Carolina, and Georgia [41]. That work found that only 49% of the population in the tristate region resides within a 30-minute drive to a JCPSC, which is similar to the results of this analysis. Second, the overall validity of the underlying cause of death specified on death certificates was unknown for our study population. We recognize that only modest agreement was observed in a study comparing underlying causes of death coded as stroke by an experienced nosologist, who did not rely on supplemental information, and those adjudicated as stroke by a study committee, which used medical records and other supplemental information [42]. Third, although we increased the drive time to adjust for some limitations, the drive-time model did not consider the possible influence of time of year or time of day. We realize that these variables can impact

**Table 3.**  
**Patients Who Died of Stroke and Had a Geocodable Residence Within a 40-Minute Drive From a Joint Commission Primary Stroke Center (JCPSC)**

Stroke type <sup>a</sup>	Patients, proportion (%), by study period <sup>b</sup>	
	2006	2008
Ischemic	407/1,060 (38)	301/489 (62)
Hemorrhagic	710/1,906 (37)	644/1,141 (56)
Unspecified	2,717/7,503 (36)	2,537/4,574 (55)
Any	3,834/10,469 (37)	3,482/6,204 (56)

Note. Data are no. of patients who resided within the drive time/total no. who died (%). There were 10 JCPSCs in North Carolina during 2006 and 22 during 2008. For all comparisons,  $P < .05$  by the  $\chi^2$  test.

<sup>a</sup>Defined on the basis of *International Classification of Diseases, Tenth Revision* codes for ischemic stroke (I63), hemorrhagic stroke (I61), and stroke, not specified as hemorrhage or infarction (I64).

<sup>b</sup>Data for 2006 involve patients who died during 2003-2005, and data for 2008 involve patients who died during 2006-2007.

**Table 4.**  
**American Stroke Association Acute Stroke Designation Advisory Committee Recommendations for Classifying Facilities as Acute Stroke Care Capable Hospitals**

**Recommendations**

These hospitals should fulfill all of the following requirements outlined for the emergency evaluation and treatment of patients with acute stroke as indicated for JCPSCs. Hospitals may achieve these criteria through a drip and ship model or telemedicine if local staffing is inadequate:

Acute stroke team & availability 24/7

Written care protocols

Emergency medical services integration

Emergency department

Commitment & support of medical organization; a stroke center director

Neuroimaging services 24/7

Laboratory services 24/7

Outcome and quality improvement activities that includes tracking of all patients seen with acute stroke and appropriate use of thrombolytic therapy

These capabilities, including collection of relevant performance measures, must be verifiable.

These hospitals may not have all of the non-acute care capabilities required of JCPSCs.

These hospitals or facilities should be encouraged to pursue formal JCPSC certification.

These hospitals should have a plan for transfer of patients to a JCPSC as appropriate based on clinical and other factors.

Note. Recommendations are for hospitals that are not Joint Commission Primary Stroke Centers (JCPSCs) [39].

the overall drive time experienced by patients. Fourth, it is important to emphasize that any statewide system of stroke care that relies on emergency responders to accurately identify patients with acute stroke in order to make appropriate destination decisions must have a prehospital stroke screen in place that has adequate specificity. Unfortunately, a study conducted in North Carolina found that one commonly used scale to screen for stroke was only 52% specific in identifying stroke victims [43]. Clearly, as the authors of that work concluded, if prehospital screening is to be used for transport diversion, the specificity of the screening scale must improve beyond 52%. Fifth, we did not consider telestroke support or the use of a field-to-stroke center helicopter transport, both of which have the ability to enhance statewide access to experts in acute stroke care. Finally, we did not consider JCPSC resources in border states, but our tristate analysis indicated no added drive-time accessibility to JCPSCs when stroke-care resources in bordering states were considered [41].

Our work indicates that non-JCPSCs currently engaged in quality-improvement initiatives for stroke care are well-placed geographically to provide much needed acute stroke treatment. This supports the opportunity to strengthen the system of stroke care in North Carolina by expanding the role of some hospitals that have not obtained designation as a JCPSC but likely have the potential to provide evidence-based acute stroke care. North Carolina should establish an additional set of evidence-based criteria for designating centers of acute stroke care that complements the JCPSC program. States considering criteria for stroke center designation that go beyond those of the Joint Commission will benefit from using GIS modeling to identify whether such designated centers adequately enhance the statewide system of acute stroke care in their state. **NCMJ**

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## Health Care Reform: A Perspective From Primary Care

Steve Shore, Gregory K. Griggs

**A**lthough the Affordable Care Act (ACA) is not perfect, it takes significant steps forward on many of the key tenets of health promotion, prevention, and primary care. This commentary discusses a few aspects of the legislation that the North Carolina Pediatric Society and the North Carolina Academy of Family Physicians believe will help improve the health of North Carolina's citizens by increasing the access to and the quality of health care delivered in the state.

First, take a look at where the US health care system stood before reform. A total of 17.2% of the gross domestic product is related to health care expenditures. This equates to \$8,160 spent on health care for every man, woman, and child in the United States. From 1999 through 2008, health care costs grew by 119%, compared with an average annual increase of 29% in inflation, and employers continued to face double-digit increases in premiums, forcing them to pass more of the cost to the employee or to eliminate benefits altogether [1].

Without a doubt, the direction of care and associated increased costs could not be sustained long-term. According to the Dartmouth Atlas, almost 1 in 3 health care dollars are used for unnecessary tests, unproven or ineffective treatments, unwanted procedures, or overpriced, cutting-edge drugs and devices that are not significantly better than the less expensive treatments they are replacing [2].

A call for changes to the US health care system is not a new proposition. In a widely cited example, the editors of *Fortune* published a critique of the system in 1970, asserting that "[t]he time has come for radical change" because "most Americans are badly served by the obsolete, overstrained medical system that has grown up around them helter-skelter" [3p79]. Regardless of one's views about the provisions of the ACA, one thing that was certain 40 years ago and remains so today is that changes were necessary for a system much in need of repair.

Consider what the ACA will do. First and foremost, the act moves toward a concept that has long been promoted by the North Carolina Pediatric Society and the North

Carolina Academy of Physicians—health care coverage for all. For more than 20 years, the American Academy of Family Physicians has advocated for health care coverage for all. The American Academy of Pediatrics has promoted the same idea, with a focus on children and adolescents. Primary care physicians understand—and see in their practices—that people without insurance delay or avoid receiving necessary preventive care, develop preventable illnesses, get medical attention at a later stage of serious illness, and, as a result of these factors, tend to have higher overall medical expenses.

Before passage of the ACA, researchers estimated that without health care reform, the number of uninsured Americans would rise to 52 million [4], and analysts estimate that in 2007, 75 million Americans were uninsured or underinsured [5]. Even those who have health insurance struggle with high copayments, deductibles, and other costs. In 2007, medical costs were an underlying cause of more than 62% of personal bankruptcies [6]. Although the ACA does not ensure coverage for all, it does take significant steps in that direction.

While we agree that individuals should acquire health insurance before they become sick, the penalties for not acquiring coverage may not be significant enough to motivate everyone to obtain insurance. For example, nationally, the average annual premium for family coverage is \$13,375 [1], yet the penalty imposed by the ACA for not purchasing insurance is less than 16% of this average premium, with a maximum penalty of \$2,085 per family.

The act strongly encourages preventive care, which helps to control costs by moving patients into medical homes. For example, health insurance plans will be required to provide first-dollar coverage (ie, coverage that does not require payment of a deductible or a copayment) for all preventive services given an A or B rating by the US Preventive Services Task Force, including immunizations recommended by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices. The ACA also heavily invests in prevention, with \$500 million authorized this fiscal year for the

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Prevention and Public Health Fund and up to \$2 billion authorized by 2015. The effort includes support for the new National Prevention, Health Promotion, and Public Health Council and funding for a national outreach and education campaign to promote health improvement. The ACA also helps educate consumers about the nutritional content of food by requiring chain restaurants and vending-machine operators to clearly post the nutritional information of their products.

Other key prevention efforts in the ACA include a childhood obesity demonstration project and competitive grants to states and communities to promote health by reducing the incidence and prevalence of chronic disease and addressing health disparities. In addition, the ACA requires that there be parity between mental health and substance abuse services and other more traditional benefits that are included in the essential benefits packages developed by the US Department of Health and Human Services.

Another key focus area is the health care workforce, particularly in the most underserved areas and for underserved populations. For example, the ACA mandates that in 2013 and 2014 and, possibly, beyond, Medicaid pay primary care physicians at 100% of the Medicare fee schedule. In addition, Medicare will offer a 10% bonus for primary care physicians in underserved areas, which encompasses a sizable portion of North Carolina, and it provides significant increases in authorizations to the National Health Service Corps for loan repayment, which is a key component of physician recruitment for rural and underserved communities in North Carolina. The ACA also authorizes the development of teaching health centers under Title VII to provide training in primary care to medical and dental residents at federally qualified community health centers. Whereas graduate medical education funding has traditionally flowed through hospitals, the creation of teaching centers recognizes the realities of ambulatory care by providing more exposure to outpatient settings that are essential to the medical home concept, so effectively used by Community Care of North Carolina (CCNC).

The provisions of the ACA move health care toward a more balanced focus on prevention, continuity of care, and chronic disease management, but they do not go far enough to bend the cost curve by improving the emphasis on primary care. Although health care costs in the United States have continued to increase dramatically, many other developed countries have produced better health outcomes at much lower costs. A key part of their systems is an equal ratio of primary care to specialist physicians. In the United States, close to 70% of physicians are specialists, with an even higher percentage of recent medical student graduates choosing careers in subspecialties. As North Carolina's public medical schools work to expand class sizes, the state must ensure that tax dollars are producing the right kind of physicians to care for the people of North Carolina well into the future.

Two other areas of emphasis in the ACA are health information technology and new models of care. North Carolina has a head start on both thanks to leadership from the statewide Area Health Education Center (AHEC) system and to cooperation between private and public medical organizations. These partnerships are a well-known hallmark of North Carolina's efforts to pilot special projects and demonstrate health care innovation. Unfortunately, the ACA does not go far enough on tort reform, but it does allow for some state demonstration projects.

Much has already been done to encourage implementation of electronic health recordkeeping technology in North Carolina, and a number of groundbreaking efforts are currently underway. Steve Cline, former deputy state health director, has recently been appointed as the state's health information technology coordinator and is leading the effort to implement technology in health care settings throughout North Carolina. Fortunately, the state has already received federal funding through the American Recovery and Reinvestment Act to jumpstart the effort. This includes \$12.6 million for building health information exchange capacity and \$13.6 million to the AHEC system for developing regional extension centers to help primary care physicians implement electronic health recordkeeping technology and to use these records effectively. Both Medicaid and Medicare are now offering significant financial incentives to practices that are using electronic records in a meaningful manner, particularly for population management and quality improvement. Collectively, these efforts reflect an appreciation of the importance of the medical home concept and quality improvement to the health care system.

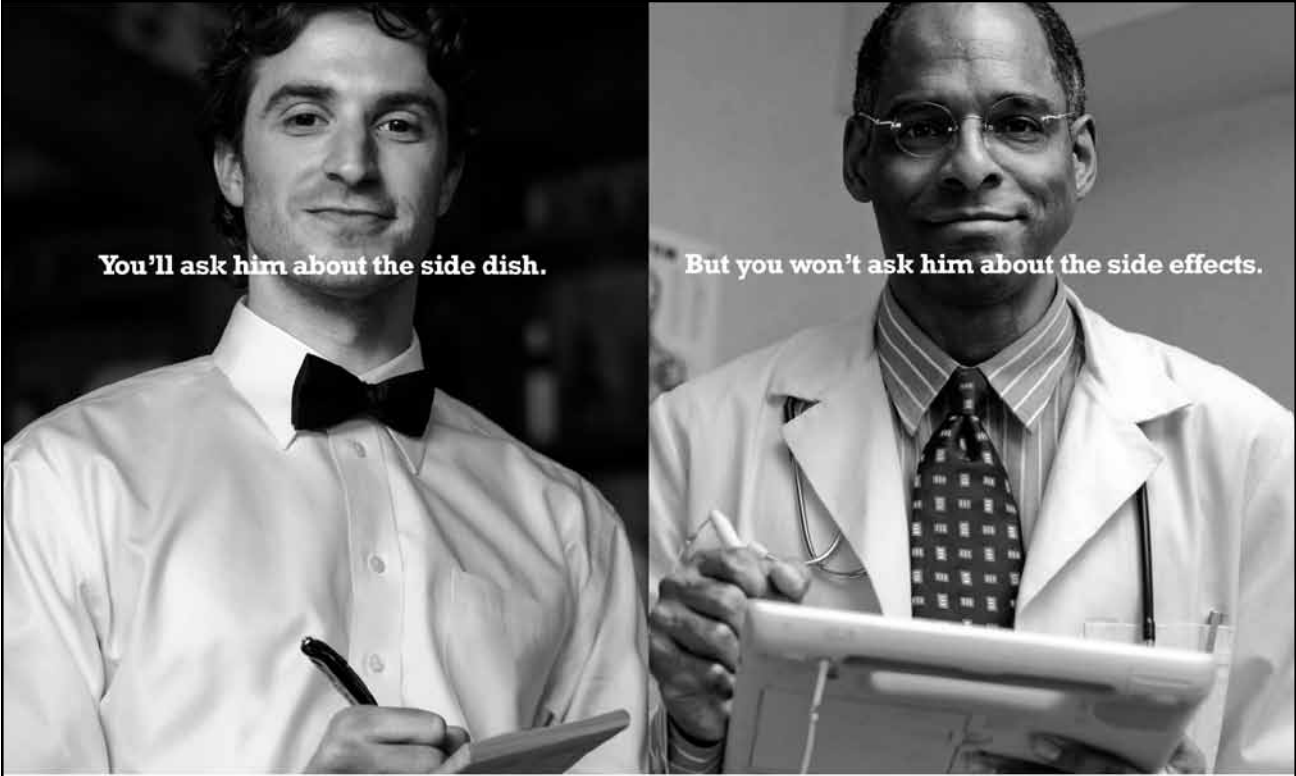
The ACA also authorizes demonstration projects to test new payment models for health care, including accountable-care organizations and the patient-centered medical home. North Carolina has already achieved national attention for multiple CCNC projects, including the program's focus on care coordination in the medical home, and there are already several new ideas in the works. Changes to payment and care models are clearly possible in North Carolina, as demonstrated by the efforts of CCNC, and will be complemented by health care reform, thanks to the strong partnership between state government, public health agencies, health insurers, and the private medical community.

Although everyone will likely find at least one item they dislike in this extensive piece of legislation, the old health care system needed to be changed. Now, North Carolina must continue to do what it does best—demonstrate, innovate, and lead—as the provisions of the ACA are implemented. If North Carolina is really serious about improving the access to and quality of health care, now is the time to start building a new health care system for the state. NCMJ





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# Putting Patients at the Forefront of Good Health Care Reform

*Robert W. Seligson*

Since 1849, the North Carolina Medical Society (NCMS) has worked to improve the health of all North Carolinians. The united purpose of its physician members—to protect and serve their patients—is not so different from what it was in 1849, when a group of physicians came to Raleigh to meet with the North Carolina General Assembly because of concerns they had for their patients' safety. Charlatans roamed the countryside at the time, using counterfeit diplomas to portray themselves as physicians and posing risk to unsuspecting patients in need of health care. As a result of the leadership of these physicians, several public health laws were enacted, including one that created a state medical board to license physicians. As health care reform associated with the Affordable Care Act (ACA) takes hold and changes are implemented, physicians continue to advocate for the health and welfare of their patients. The preservation of the relationship between physicians and their patients is central to physicians' concern about the enactment of the ACA.

The ACA was signed into law by the president on March 23, 2010, after several months of some of the most turbulent and partisan debates in recent American history. Although many questions remain regarding the impact of this legislation, physicians remain united in seeking the best care possible for their patients. Legal and political wrangling will continue for years to come while the country seeks to fix what is broken in health care delivery and to improve what is working. What is certain is that physicians and patients must work together to take advantage of opportunities to improve the access and care that patients need and deserve. The new legislation provides opportunities to improve and measure the quality of care patients receive and to electronically transfer patient information among health care professionals and organizations, to reduce duplication and errors. It also raises the exemplary work of some North Carolina programs, such as Community Care of North Carolina (CCNC), to national prominence.

To help physicians and their practices thrive in a new health care environment, the NCMS has been working closely with its members to educate them about the changes

that will take place. Physicians are actively engaged in discussions related to health information technology and the exchange of patient information among health care providers. Central to this discussion is concern for patient privacy and information security. Physicians want patients to benefit from changes introduced by the ACA, and they also want to ensure that the patient-physician relationship remains the foundation of quality health care. North Carolina is home to 4 medical schools and a wide range of continuing-education programs. The NCMS works with health care professionals from across the state and around the country to implement aspects of the health reform legislation it views to be strong and to improve parts of the legislation it considers to be weak. For example, the NCMS Foundation has embraced the quality standards presented in health care reform by requiring practices participating in its Community Practitioner Program to commit to the process of becoming a patient-centered medical home with electronic health records. In addition, the NC Physician Institute for Quality Enhancement will assist physicians in quality improvement, with a specific focus on specialty care. The NCMS Foundation's Leadership College is currently undergoing major modifications to address the demands and requirements of the health care reform legislation and to assist physicians to become better leaders as they meet the challenges of today's health care environment.

The physician community supports health system reform that addresses access to care, workforce training, health care quality, patient safety, patient education, informed choice, financing, and cost management. As part of this effort, the NCMS is educating its members about the development of accountable-care organizations and, in 2009, released a document summarizing its position on health reform [1]. According to the NCMS, one positive aspect of the ACA involves provisions that promote prevention and wellness. Specifically, health plans must now cover preventive services such as vaccinations and screening tests without charging a copayment or deductible. Flu shots, childhood and adult vaccinations, and cancer screening will keep North Carolinians healthier and keep down the cost of medical

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care. Together, physicians and patients will work as a team to promote health instead of simply treating illness. Another positive aspect involves the expansion of health insurance coverage to uninsured residents of North Carolina. A new insurance pool will allow uninsured people to buy coverage if they have preexisting conditions. Cancer survivors and individuals with chronic diseases such as diabetes or high blood pressure will receive coverage for care that helps improve their health.

However, to maximize prevention and wellness, North Carolinians have a responsibility to take better care of themselves through exercise and nutrition. In partnership with physicians and other members of their health care team, individuals have the opportunity to improve their own health and, thus, increase the health care savings yielded by a healthier population.

### Medicaid

CCNC has led by example, providing patient-centered medical homes for patients with chronic conditions. CCNC's use of the patient-centered medical home model has improved the care of many of the state's most vulnerable citizens and has saved federal and state governments hundreds of millions of dollars [2]. Hopefully, the ACA will facilitate expansion of CCNC, enabling this organization to continue its great work throughout the state.

Recent budget shortfalls in North Carolina have had an adverse affect on the Medicaid budget and have threatened CCNC. The budget shortfalls projected for 2011, as well as the federal deficit, increase the challenges associated with providing adequate reimbursement to physicians for the services they provide to Medicaid recipients. Physicians and their partners in health care must come up with new, innovative solutions to address these challenges. For their part, physicians have long been providing charity care to North Carolina residents. On the basis of conservative estimates [3], North Carolina physicians practicing at free clinics, in private practices, and in access projects (ie, Project Access and the Healthy Communities Access Program) provide charity worth \$342 million annually.<sup>a</sup>

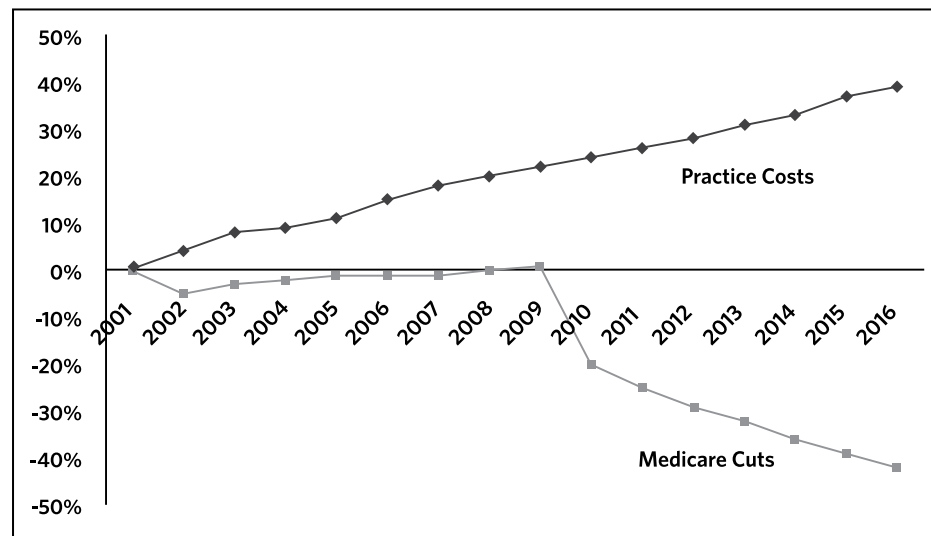
### Access to Care and Patient Services

The ACA provides expanded access to primary care, increases the reimbursement for primary care services, and expands payments for graduate medical education for primary care. The ACA is also presented in terms that patients and physicians can understand—Congress wisely included provisions to replace volumes of legal jargon with summaries and simple labels. Patients will no longer have to wonder whether certain services or treatments are covered or whether they can afford associated copayments or deductibles. Provisions to simplify administrative activities, such as uniform transparent operating rules for electronic transactions, eligibility verification, claims remittance and payment processing, and electronic fund transfers within a specific period, were also added.

### Medicare

Improving funding for Medicare is one of the major areas that the ACA did not address. Medicare is the largest government health plan in existence. Although Medicare is the foundation for many of the changes that the new law will bring, it is currently unhealthy, with some physicians forced to make the difficult choice of limiting the number of Medicare recipients they treat—or treating none at all. Key leaders in health care must work together to avoid a Medicare meltdown for older North Carolinians and to ensure that coverage will be available for others in the future. At the same time, imme-

**Figure 1.**  
**Comparison of Projected Medicare Reimbursement and Physician Practice Costs, 2001-2016**



Note. Adapted from [7].

a. Calculated as [number of practicing physicians] × [percentage providing free care] × [duration of care provided, in hours/month] × [salary/hour] × [12 months/year], or 18,000 × 0.72 × 11 × 200 × 12.

diate steps need to be taken to ensure that Medicare and other government-funded programs are made solvent and that new programs are implemented with proper financial sustainability. North Carolina is one of the states that made the American Medical Association's "access hot spots" list, which highlights areas where access to care is at risk for Medicare-eligible patients [4].

The problem will get worse unless Congress repeals the broken Medicare physician payment formula known as the sustainable growth rate (SGR). In North Carolina, approximately 16% of the population is enrolled in Medicare [5]. Although reimbursement cuts have yet to take effect, the state has a shortage of physicians who treat Medicare recipients, with a ratio of physicians to Medicare beneficiaries that is below the national average [5]. Concern about this shortage is enhanced when one considers that approximately 39% of North Carolina's practicing physicians are older than 50 years of age [5] and that a recent survey showed that many physicians aged 50 years or older are considering reducing their patient-care activities [6]. What is needed is a rational Medicare physician payment system that does not diminish physicians' ability to keep up with the cost of running a practice and providing quality care to the state's older adults.

The growing federal deficit will make it difficult for Congress to abandon the SGR. Under the ACA, more people will be covered, but many public and private health insurance plans will be indexed to the Medicare fee schedule. This is simply unsustainable and fails to address the reform needed to cover the real cost of health care delivery. Most likely, services will either be limited or cancelled because of inadequate reimbursement to cover their cost. Physician practices are operated in the same way small businesses are

operated. In today's economic climate, health care provides a substantial contribution to the state's economy. In small, rural communities the contribution is even greater. The pain experienced by small businesses across North Carolina and the nation is not unlike the difficulties experienced by physicians trying to keep their practices viable. To provide services to older citizens and underserved individuals, physicians and patients need a Medicare payment system that realistically and adequately addresses the cost of providing this care.

Although the new law insures more Americans, it places incredible pressure on the physician community. The issue of physician supply is at the forefront of health system reform, and primary care has to be a central focus of the discussion. Efforts must be made to enhance information systems and expand comparative effectiveness research. With adequate financial support, physician services will be able to embrace both. However, physicians must be equipped with better information technology and have more access to comparative effectiveness research. Burdening physicians with practice incentives that fail to recognize the vast socioeconomic differences unique to each of the regions in North Carolina puts many physicians at a disadvantage. Medicare reimbursement is projected to decrease at a time when physicians' services for the segment of the population aged 65 years and older are expected to continue increasing in quantity and complexity, owing to the state's aging population (Figure 1).

### Tort Reform

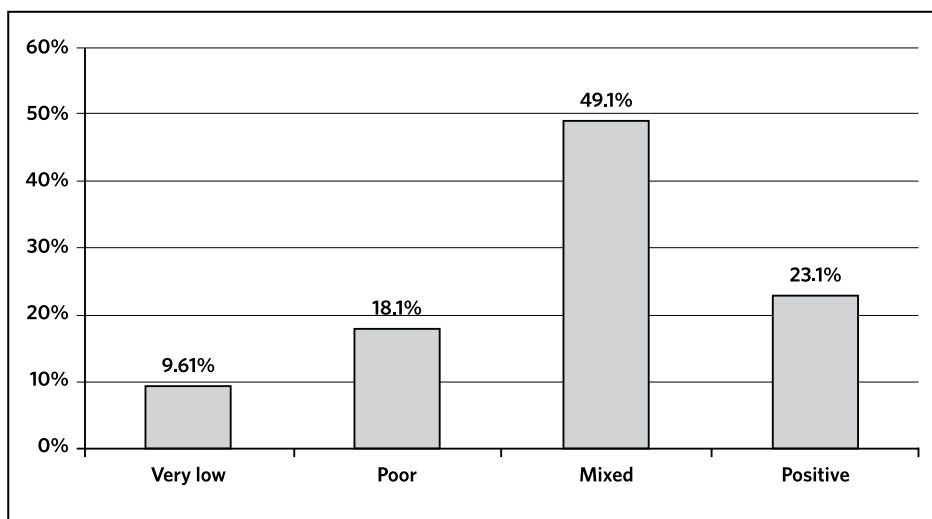
The ACA does not adequately address tort reform. Only small inroads have been made to address true tort reform initiatives. States that have enacted medical liability reform have improved care in medically underserved communities

and access to high-quality specialists who perform high-risk procedures [8]. Major tort reform laws are critical to ending the practice of defensive medicine and lowering the cost of health care. Without meaningful liability reform, billions of health care dollars will continue to be wasted, the cost of health care will continue to rise, and delivery of health care to North Carolina's most vulnerable citizens will continue to be inhibited.

### Rural Health Care

Finally, adequate payment for primary care and specialty services is even

**Figure 2.**  
**Self-Reported Professional Morale Among Physicians**



Note. Data are from [6].

more critical for rural areas. The rural health infrastructure in North Carolina is suffering. To ensure that residents in rural North Carolina receive access to excellent health care, it is critical to retain physicians and other primary care professionals in rural communities. New legislation increases the amount of federal dollars available to recruit physicians into rural and underserved areas of the state through the National Health Service Corps. In North Carolina, the Office of Rural Health and Community Care and the NCMS Foundation's Community Practitioner Program also address physician recruitment, offering loan-repayment incentives and assistance with private-practice development. Rethinking the approach to regulating and financing medical care in rural areas is necessary if the state wishes to retain physicians in these communities and achieve the efficiency and quality improvements patients deserve.

### Physician Satisfaction

The Physicians' Foundation for Health System Excellence recently surveyed physicians about their satisfaction with the current practice environment (Figure 2). More than 60%

of respondents were either unsatisfied or less than satisfied [6]. Burdensome regulations, ineffective technology, declining reimbursements, and liability are all impediments to physicians' ability to provide quality health care. This trend tracked similarly at both the state and national levels.

### Conclusion

The most important point in the health care debate—putting the patient's best interest at the forefront of reform—must not be lost. It is the desire of all physicians to address their patients' best interest, and to do so in a way that ensures that the physician-patient relationship is free from outside influences. If health system reform facilitates this type of patient-physician relationship, the NCMS believes that most physicians will support it. If it does not, it is essential that patients and physicians be permitted to structure their relationships, without outside influence that would detract from the patients' medical needs and interests. Regardless of any current or future reforms, making quality and efficient health care available to all citizens will continue to be one of the greatest challenges facing medicine. NCMJ

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# POLICY FORUM

## *International Health Initiatives in North Carolina*

### Introduction

We readily understand that health and health care are becoming an increasingly global concern, but how this plays out locally is less well understood. In these times, North Carolinians are much more likely to feel the effects of an infectious disease outbreak that originates beyond the borders of the United States because we are much more connected to populations on other continents. We are beginning to see the emergence of a global market for health care services, as “medical tourism” and the international trade in pharmaceuticals grow and influence the prices we pay and the opportunities we confront in choosing therapies. North Carolinians lead in the development of cures for diseases that are endemic far from our laboratories, and we develop systems to help ensure clean air and water and effective public health delivery systems in nations on all continents. The global reach of these discoveries and developments is extraordinary, but they are often equally applicable in our own communities.

North Carolina and the rest of the nation draw on the skills of health care professionals from many other countries. We are recognizing that we have responsibilities beyond our borders for training health professionals to care for other populations. We can easily recognize a global market for pharmaceuticals and health technology, and we are beginning to see that this can apply to health-associated human resources, as well. This happens in the short term as North Carolinians are touched by the crises and disasters that affect other nations and contribute their skills and resources to caring for people who have extraordinary needs. In the long term, we are seeing collaborations being built, with North Carolina institutions and programs connecting across the globe to train practitioners for the world and for our state.

These conditions compel North Carolinians to compete in global markets and to help seek solutions to global needs. This issue of the NCMJ highlights how our health care professionals and institutions in the state fit into global health and how global health conditions and needs affect North Carolina.

*Thomas C. Ricketts III, PhD, MPH*  
*Editor in Chief*

# Understanding the Relevance of Global Health to North Carolina

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

**A**round 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.

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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 <sup>a</sup>	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 <sup>a</sup>	267.48	220.34	20.99	508.81
Jobs, no. of units, total <sup>a</sup>	3,496	3,064	581	7,141

Note. Data are from [9].

<sup>a</sup>Includes 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 B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub>, and G<sub>2</sub> 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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# One Health and Climate Change: Linking Environmental and Animal Health to Human Health

Barrett D. Slenning

The One Health Initiative was formed in 2007 by the American Medical Association and the American Veterinary Medical Association “to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, and other scientific health professionals” [1]. Many public health professionals also view environmental health as essential to the purpose of One Health. The basic idea is that human health cannot be protected unless animal health and environmental health are also addressed. This concept is not new; Sir William Osler, recognized as the founder of modern medicine, coined the term “one medicine” in the late 1800s [2]. Recent incidents involving emerging zoonotic diseases and public health consequences of environmental degradation have led to urgent calls for veterinary medicine, human medicine, and environmental health approaches to be combined and prioritized. One means to explore the One Health perspective is to assess global climate change (GCC), since GCC affects the environment in which humans and animals, as well the disease vectors and pathogens affecting both groups, exist.

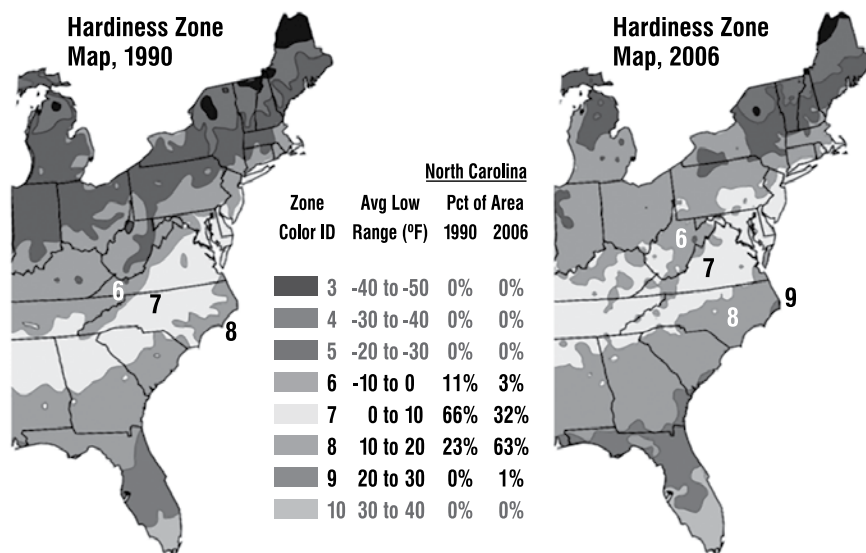
## Fundamentals

The theory and physics of greenhouse gases and climate were described during the late 1700s and the mid-1800s [3]. GCC is supported by compelling scientific evidence from multiple independent sources (eg, weather records, glacier dynamics, geochemistry, satellite imaging, and tree-ring investigations). Although controversy has dogged GCC for decades—and has flared recently—there is strong scientific evidence for a direct relationship between current climate changes and increasing anthropogenic greenhouse gases, primarily carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) [4].

Comparison of plant hardiness zone maps for 1990 and 2006 offers evidence that GCC is occurring (Figure 1). As demonstrated in the maps, the zones have generally moved north, indicating broad warming trend in the United States. For North Carolina, the dominant zone in 1990 (ie, zone 7) was, by 2006, superseded by the next warmest zone (ie, zone 8). Concurrently, the colder zone 6 contracted, and the warmer zone 9 made its first appearance on the state’s eastern shores. In 16 years, then, the state became warmer from the beaches, through the Piedmont, and across the mountains.

GCC does not, however, simply involve increasing average temperatures. A variety of events arise, including changes in ocean chemistry, changes in the frequency and intensity of extreme weather episodes, and shifts in seasons and geographic ecosystems [6]. These large-scale dynamics influence local-scale ecosystem health by altering growing seasons and decoupling relationships between plants, animals, and vectors. Unfortunately, because of inherent uncer-

**Figure 1.** Comparison of US Department of Agriculture Plant Hardiness Zones for the Eastern United States, 1990 and 2006



Note. Data are adapted from [5] and used by permission of the Arbor Day Foundation. Hardiness zones in North Carolina during 1990 and/or 2006 are in boldface.

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tainties about the degree and rapidity of local changes, the health consequences of GCC cannot be predicted exactly.

Practitioners must recognize the difference between *climate* and *weather*. Weather happens at a given locality over a short period; climate is the combination of local effects into large-scale long-term trends. Thus, oscillations in weather (such as North America's cold winter of 2009-2010) are expected within a generally warming climate. Global records from the National Oceanic and Atmospheric Administration show that the period from December 2009 through February 2010 was the fifth warmest on record [7]. The main point is that climate (ie, long-term trends) determines ecosystem health over time but can hide weather (ie, short-term local trends) that drives immediate disasters and resulting health impacts.

### Ecosystem Health

GCC will affect ecosystem health, and the negative impacts of changed climate parameters will likely outweigh benefits for most animals and humans [8]. A nonexhaustive list of GCC outcomes, by ecosystem effectors and entities affected, is specified in Table 1. Of note, although Table 1 breaks a system of systems into discrete categories, the categories, by definition, specify interactive factors and are not separable.

Discussion of specific items in Table 1 conveys some of the complexity of the systems involved. For instance, permafrost thawing is part of a potentially rapid, nonlinear feedback system that influences GCC both as an outcome of an effector and an effector itself. Permafrost covers approximately one-fourth of the earth's landmass and contains nearly double the atmospheric mass of carbon. Many permafrost areas are receding. As they melt, they release CO<sub>2</sub> and CH<sub>4</sub>. These greenhouse gases induce further atmospheric warming, which could accelerate permafrost melting and release more greenhouse gases. Increased temperatures would result, potentially yielding a runaway feedback process [9].

Marine and aquatic acidification has potentially devastating consequences for coral reefs, on which 25%-33% of marine life depends. Atmospheric CO<sub>2</sub> dissolves in water, lowering its pH and destabilizing coral substrates. Research suggests that if atmospheric CO<sub>2</sub> stabilized at a concentration of 450 ppm, the resulting change in ocean

pH could endanger 92% of coral reefs [10]. Frighteningly, 450 ppm of CO<sub>2</sub> approximates a *near best-case* scenario for future concentrations [11].

A final example illustrates system interrelationships. Decoupled ecologic interdependencies are outcomes that involve interconnected species and ecosystems. For instance, research has identified increasing mistiming

**Table 1.**  
**Dynamics of Global Climate Change, by Ecosystem Effectors and Entities Affected**

Variable	Outcome(s)
<b>Contributing effector</b>	
Temperature change	Extreme weather events Glacier melting Permafrost thaws Sea level rise Weather variability
Chemical events	Atmosphere-component concentration changes Marine and aquatic acidification Soil-component concentration changes
Hydrologic events	Drought and floods Extreme weather events Glacier melting Sea level rise Weather variability
<b>Entity affected</b>	
Ecosystem	Biodiversity loss Decoupled ecologic interdependencies Ecologic niche changes Food and feed insecurity Habitat destruction Productivity loss Water insecurity
Human/animal populations	Environmental-refugee emergence Incident foodborne disease (humans only) Incident infectious diseases Incident vectorborne disease Incident waterborne disease Invasive-species emergence Malnutrition Population growth, contraction, and movement Social conflict (humans only) Trauma

Note. Outcomes are ordered alphabetically. Outcomes appearing in more than one category might have different causal mechanisms.

between migratory bird nesting and peak food abundance, owing to earlier plant germination and flowering (which are driven by temperature) relative to photoperiod cycles (which drive bird migrations) [12]. The resulting decrease in food supplies predisposes bird populations to malnutrition and disease. Concomitant habitat destruction compels birds of several species to crowd into shrinking ecological niches and increases the frequency of cross-species pathogen transmission, which has likely been occurring with the H5N1 avian influenza strain since 2003.

## Direct Human and Animal Health Effects

Although the rising sea level due to temperature changes clearly damages coastal areas and low-lying islands, it also allows salt water intrusions into inland water tables (Table 1). A Fall 2008 report suggests that over half of the North Carolina coast is at “very high risk” for adverse events associated with a rising sea level [8]. Part of this risk is from erosion and subsidence, but part is from damaged ground water resources, on which 98% of North Carolina water systems depend [8]. Human, animal, and ecosystem damage associated with a lack of water quality and availability is, therefore, a major concern.

Additionally, the expected increase in extreme heat events will have health consequences. Thirty years of research in North Carolina found that each 1°F increase in average summer temperature raised the rate of heat-related deaths by 59% [13]. This is sobering, because 4°F-9°F increases in southeastern average temperatures are expected over the next 70 years [14].

## Emerging and Re-emerging Diseases

Despite uncertainties surrounding GCC and ecosystem health, there are well-recognized disease-associated consequences of weather events. For instance, temperature-driven and hydrology-driven increases in extreme weather events will play out in several ways (Table 1). Obvious health-related effects from droughts or floods are immediate trauma, crop failures, food and water insecurities, and other population stressors. Not so obvious, however, is the potential for increased human waterborne diseases (eg, giardiasis and shigellosis) outside of disasters. For instance, public health data demonstrate that two-thirds of waterborne disease outbreaks occur after rain events that are among the top 20% in terms of intensity, most of which do not qualify as disasters [15]. As extreme weather events increase in frequency, so too will outbreaks of waterborne diseases among humans. There is no reason to assume a similar dynamic does not occur among wildlife.

Although vectorborne diseases and GCC are a major concern, the story is not simple. North Carolina has a long history with tickborne and mosquito-borne diseases, and pathogens currently not endemic to the United States (eg, the viruses that cause dengue fever and Rift Valley fever) have competent vectors in North Carolina and therefore threaten the

state. There is little argument that as regions warm, impediments against vector survival diminish at higher latitudes and higher altitudes. However, climate is not the sole driver for the spread of vectorborne disease. As a simple example, West Nile virus arrived in North America during 1999 through human travel and rapid transportation, not because of ecosystem changes. Furthermore, climate change-associated improvements in habitat do not ensure a new vector's success. For instance, incursions of *Aedes albopictus* organisms (ie, Asian tiger mosquitoes) into the southeastern United States have been limited because the larval stages of the species are smaller than those of the indigenous species *Aedes triseriatus* (ie, treehole mosquitoes), and they are taken by predators at higher rates [16]. Higher predation has so far blunted the ability of *A. albopictus* organisms to become endemic. The point is that sole dependence on climate models to predict such events is of doubtful usefulness [17].

There are, however, current examples of climate-related agent and/or vector incursions to territories or regions where they are newly endemic. Bluetongue virus, a disease agent among livestock, was unknown north of the Mediterranean until recently. Warmer winters allowed its traditional African/Asian vector, *Culicoides imicola*, to become endemic in southern Europe during the 1990s. The virus then began using indigenous European *Culicoides* species as vectors [18]. Another example is seen among oysters, which play a major economic role in coastal North Carolina. Dermo, a devastating protozoal disease caused by *Perkinsus marinus*, became established among Chesapeake Bay oysters during the 1980s and 1990s, when drought yielded increased salinity, when there were long periods of warmth during the spring and fall, as well as warm winters—conditions GCC will exacerbate. As a result, area oyster beds are now 5% of their previous size [19]. As a third current example of climate-related disease effects, the incidence of human disease due to tickborne pathogens has increased as the burden of tick vectors increased in the wake of GCC. Workers from Sweden have shown that a 20-year increase in the incidence of tickborne encephalitis among humans is significantly related to changes in the tick-vector burden during milder winters and earlier arrivals of spring [20]. It is therefore important for decision makers to realize that climate is one factor—sometimes a determining factor—in whether a disease agent or vector expands or contracts its territory of endemicity.

## Preparation and Mitigation

Many issues discussed here are poorly understood by scientists, let alone by political and commercial decision makers. A major effort in preparing for the health impacts of GCC, then, should be to promote research that provides information about effectors and outcomes, including the interdependencies that are uncovered as initial subjects are explored.

Figure 1 implies an important way to mitigate GCC effects on human, animal, and ecosystem health: we must adapt to generally warmer, yet more variable, weather patterns.

Oscillations between drought and extreme amounts of precipitation suggest soil protection will be central to maintaining food and water supplies and to limiting downstream contamination. All of these factors are important for human and animal health.

Parts of society are at special risk during extreme weather events: people who are homeless, are very old or very young, are poor, and/or work outdoors. Establishing mitigation tools and plans for these groups should happen now. Hospital emergency departments should establish triage protocols and supplies as warm seasons increase in duration and become more severe. Likewise, public safety and public health professionals must increase public education programs about the risks and harm heat waves can produce.

Planning for changes in the array of infectious diseases faced under GCC is a challenge, yet some activities should start now. Bolstering mosquito abatement activities and public education to minimize mosquito and tick exposures would

be constructive. First-line medical professionals should augment their training in awareness, diagnostic tests, and therapy for what are now considered “foreign” vectorborne, waterborne, and foodborne diseases. Importantly, academia must find time to expose students to interactions between environmental health, animal health, and human health.

Last, society must increase its resources and support for public and environmental health activities. Unfortunately, 33 states, including North Carolina, have *decreased* public health budgets in the past year, resulting in staffing cuts at more than half of local public health agencies [21]. A continued partnership between first-line practitioners—veterinary and medical—and public health professionals, biologists, and epidemiologists offers the best chance to make early determinations of emerging health threats. It is essential that we take these larger, more encompassing views of what constitutes health and what our roles need to be. And *that* is what One Health is all about. NCMJ

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# Significance of Aflatoxins in Rural and Global Health: Concern for Agricultural Workers

Mustafa I. Selim

**A**flatoxins B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub>, and G<sub>2</sub> are highly toxic and carcinogenic secondary metabolites produced by *Aspergillus flavus* and *Aspergillus parasiticus* fungi. Aflatoxin B<sub>1</sub> (AFB<sub>1</sub>) has been recognized as one of the most potent chemical carcinogens [1]. The acute toxicity, mutagenicity, and carcinogenicity of aflatoxins are associated with the presence of the 8,9 double bond and the terminal cyclopentanone ring (Figure 1). The order of the severity of acute and chronic toxicity is B<sub>1</sub> > G<sub>1</sub> > B<sub>2</sub> > G<sub>2</sub>, reflecting the role of the 8,9 double bond and the greater potency associated with the cyclopentanone ring of the B series [2].

## AFB<sub>1</sub> Contamination

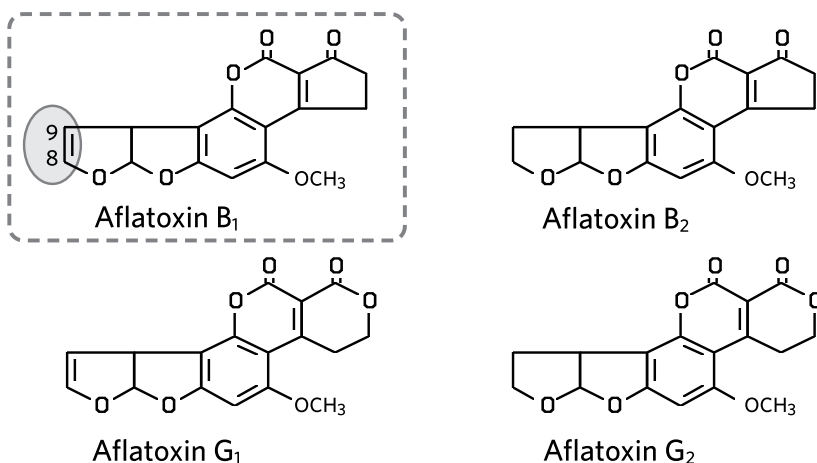
AFB<sub>1</sub>-producing fungi (ie, *A. flavus* and *A. parasiticus*) are found naturally in soil and airborne dust. They invade many crops (eg, corn and groundnuts) and the crops' processed products in search of nutrition during fungal growth and maturity. Fungal invasion of corn, for example, takes place late in the growing season under hot (optimum temperature, 80°F-100°F) and humid conditions [3]. Increased fungal infestation is facilitated by plant stress due to poor agronomic methods, drought, and damage from strong winds, birds, and insects [4]. After harvest, the quantity of AFB<sub>1</sub> produced in contaminated corn usually continues to increase under unhygienic, hot, and humid storage conditions. Improper storage of contaminated grain may also result in fungal spread and increased production of AFB<sub>1</sub>. Similarly, improper processing and storage of other agricultural commodities (eg, cereals, peanut, seeds, and nuts) may result in fungal infestation and aflatoxin production [5]. Worldwide, studies have shown that AFB<sub>1</sub> is commonly detected in dried fruits, vegetables, herbs, and medicinal plants, particularly in developing countries where proper processing and storage practices are not followed [6].

## Dietary Exposure to AFB<sub>1</sub>

Human exposure to AFB<sub>1</sub> occurs directly through consumption of contaminated foods (eg, cereals, nuts, dried fruits, and vegetables) and indirectly through consumption of animal products (eg, meat, milk, poultry, and eggs). The problem of human consumption of foods contaminated by AFB<sub>1</sub> is most serious in developing countries that lack proper processing procedures, storage facilities, and food-safety monitoring [7-9]. In addition, many of the rural populations in developing countries are dependent on stored grains for their daily diet and for feeding domestic birds or animals. Such practices constitute significant health risks through the propagation of hazardous levels of AFB<sub>1</sub> in the daily diet, owing to consumption of domestic birds and animals that have been fed contaminated grain.

Although consumption of significant levels of AFB<sub>1</sub> is commonly believed to be confined to countries lacking adequate storage facilities, the cumulative exposure to sources of AFB<sub>1</sub> among persons in developed countries could be significant. Recent evidence from Europe strongly suggests that most exposure to AFB<sub>1</sub> emanates from unidentified sources

**Figure 1.**  
**The Four Common Aflatoxins**



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and is much higher than was previously suspected [10-12]. A study of cadaver tissues in England showed aflatoxin-DNA adduct levels nearly as high as those found in areas of Southeast Asia and Africa noted for high exposure to AFB<sub>1</sub>.

### **AFB<sub>1</sub> and Liver Cancer**

Acute toxic effects of aflatoxins have been fully documented for a large number of animal species and humans [1, 13-15]. AFB<sub>1</sub> has been recognized to produce cancer in the liver and other organs in a broad variety of animal species [16]. Epidemiological studies in Africa [17, 18] and Southeast Asia [19] have shown a strong correlation between the incidence of liver cancer among humans and the levels of AFB<sub>1</sub> contamination in their daily diet. An epidemiological study in Swaziland, a country with a food supply dependent on imported grains, showed an association between the incidence of liver cancer and the estimated levels of AFB<sub>1</sub> in the daily dietary intake [18].

Recent advances in molecular biology and concomitant understanding of the metabolism of AFB<sub>1</sub> have led to a better understanding of the interaction between AFB<sub>1</sub> and cellular DNA. AFB<sub>1</sub> reacts almost exclusively at the N<sup>7</sup> position of guanine after activation to its reactive form, 8,9-*exo*-epoxide (AFB<sub>1</sub>-8,9-*exo*-epoxide). The use of biomarkers has allowed the estimation of the amount of AFB<sub>1</sub> consumed at the individual level. In addition, specific assays have been developed and validated to measure aflatoxin-albumin adducts in serum [20], AFB<sub>1</sub> metabolites in urine [20, 21], and aflatoxin-N<sup>7</sup> guanine adducts in urine [22]. Results of these studies indicate that the aflatoxin-N<sup>7</sup> guanine adduct assay is well correlated with primary liver damage and accurately measures recent AFB<sub>1</sub> intake [23]. These assays, as well as the understanding of the pathways and metabolic products of AFB<sub>1</sub>, provide additional evidence about the role of AFB<sub>1</sub> in the pathoetiologic process of hepatic and pulmonary carcinomas.

### **Metabolism and Biological Detoxification of AFB<sub>1</sub>**

The cytochrome p450 enzyme system is central to the metabolism of AFB<sub>1</sub>. Because AFB<sub>1</sub> is relatively hydrophobic, it must be processed via enzyme-catalyzed reactions prior to excretion. As with the detoxification of many xenobiotics, the metabolism of AFB<sub>1</sub> involves activation and conjugation reactions. During activation, AFB<sub>1</sub> is biotransformed through hydrolysis, oxygen demethylation, or epoxidation reactions that yield one of several molecules [24].

Of the metabolic products created during phase I activation reactions, the most biologically important is the highly reactive electrophile AFB<sub>1</sub>-8,9-epoxide. This product has been found to exist in 2 stereoisomers, of which the *exo* form is much less stable in water and approximately 500 times as mutagenic as the *endo* isomer. The increased mutagenicity of the *exo* isomer is attributed to its steric configuration that allows covalent bonding DNA, almost exclusively between

the N<sup>7</sup> of guanine and the C<sup>8</sup> of the 8,9-*exo*-epoxide [25-31]. Alternatively, the epoxide may be excreted as a glutathione-conjugated metabolite. Other cytotoxic effects of the epoxide include inhibition of liver protein synthesis and other protein interactions [32].

### **Association Between AFB<sub>1</sub> Exposure, Dietary-Protein Deficiency, and Liver Cancer**

Previous studies from Africa and Asia provide evidence for an association between liver cancer, dietary-protein deficiency, and AFB<sub>1</sub> exposure in humans [33-37]. For example, in Africa, kwashiorkor, which is common among children with dietary-protein deficiency, has been linked to ingestion of aflatoxin because their tissue cannot metabolize or excrete the toxin [5, 38, 39]. These studies implicate the inability of tissue in such children to metabolize or excrete the toxin. In addition, the severity of AFB<sub>1</sub>-related acute hepatotoxicity and hepatocarcinogenicity has been found to decrease after dietary supplementation with proteins that alter the distribution of AFB<sub>1</sub> and, thus, its toxicity and carcinogenicity [15, 40]. Castelli and colleagues [41] reported that administration of a diet containing 10.32% total protein plus 2 ppm AFB<sub>1</sub> prevented the development of liver tumors during the 300-day study period. Other studies have documented the effect of dietary protein in suppressing tumor development in animals exposed to cancer-causing agents such as nitrosamine and polychlorinated biphenyls [42-45].

No information is currently available about the mechanism by which proteins reduce or prevent the carcinogenic potential of AFB<sub>1</sub>. The results in the studies cited above could be explained by a process in which the additional protein simply provides the necessary amino acids needed to bolster cellular biotransformation, a defense mechanism of protection. However, current knowledge regarding a molecular basis for the carcinogenic effects of AFB<sub>1</sub> (through the formation of the genotoxic AFB<sub>1</sub>O and subsequent binding with DNA) and the potential formation of adducts between proteins and AFB<sub>1</sub> or transformation products suggest that a molecular mechanism may also be at work.

### **Occupational Exposure to AFB<sub>1</sub>**

Although dietary exposure to AFB<sub>1</sub> has been widely recognized, evidence has been accumulating to suggest potentially high risks of occupational exposure to AFB<sub>1</sub> through inhalation [46-52]. The presence of AFB<sub>1</sub> in corn and corn dust during years with relatively normal weather conditions and the increased risk of *A. flavus* infestation during drought conditions suggest that airborne exposure during agricultural activities should be of considerable concern. Twenty-four samples of airborne dust were collected from 8 farms in Iowa during harvest, 22 samples of airborne dust were collected from 9 farms during animal feeding, and 14 sets of Andersen samples were collected from 14 farms during bin cleaning. Fourteen samples of settled dust and 18 samples of bulk corn were also collected and analyzed. The airborne

concentration of AFB<sub>1</sub> detected in dust collected during harvest and grain unloading ranged from 0.04 to 92 ng/m<sup>3</sup>. Higher levels of AFB<sub>1</sub> were found in the airborne dust samples collected from enclosed buildings where animal feeding occurred (concentration, 5-421 ng/m<sup>3</sup>) and during bin cleaning (concentration, 124-4,849 ng/m<sup>3</sup>) [53]. AFB<sub>1</sub> levels of up to 5,100 ng/g were detected in settled dust collected from a confined environment in Iowa where animal feeding occurred.

The levels and distribution of AFB<sub>1</sub> in aerosolized grain dust were measured in samples collected from 11 Iowa farms during bin cleaning, which occurs infrequently but confers potential exposure to highly hazardous AFB<sub>1</sub> levels. The mass of each particle-size fraction was determined, and the average AFB<sub>1</sub> concentration for each fraction was calculated. Particles with diameters <2 μm contained, on average, approximately 10 times the concentration of AFB<sub>1</sub> than particles with diameters ≥2 μm, but the smaller particles only comprised one-fourth of the total measured airborne concentration of AFB<sub>1</sub>. These data demonstrate that farmers and farm workers may be exposed to potentially hazardous concentrations of

AFB<sub>1</sub>, particularly during bin cleaning and animal feeding in enclosed buildings.

The research described here is focused on 2 related areas that have implications for North Carolina: (1) investigating the health effects associated with farmers' exposure to airborne particulates and mixtures of hazardous chemicals (eg, mycotoxins, endotoxins, glucans, and microbial toxins) and (2) developing safe and effective biotechnological approaches for preventing the toxic and carcinogenic effects of AFB<sub>1</sub> in human food and animal feed. This research is based on current proteomic knowledge and the use of modern analytical techniques (eg, liquid chromatography quadrupole time-of-flight mass spectrometry) to separate and identify peptides and proteins of agricultural origin for effective detoxification of AFB<sub>1</sub>. Findings of these investigations will also improve understanding of the interaction between small toxic molecules and large biomolecules that, in the future, may be used to detoxify other highly toxic chemicals. The goal is to prevent harmful exposures in the field and during food processing, as well as to understand the mechanisms by which these substances cause harm. NCMJ

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# North Carolina's Health Care Workforce: How Global Are We?

Leah E. Masselink

The globalization of health care is often characterized as an up-and-coming phenomenon, but one aspect of the US health care system has been “globalized” for many years: internationally educated health professionals have played a significant role in the provision of health care in the United States since at least the 1960s. Today, international medical graduates (IMGs) compose approximately 25% of the nation’s physician workforce, and internationally educated nurses (IENs) compose at least 5% of the nursing workforce [1, 2]. The largest source countries of IMGs are India, the Philippines, Pakistan, and Canada [1], and the largest source countries of IENs are the Philippines, Canada, the United Kingdom, and Nigeria [2]. Although data on internationally educated dentists are more difficult to obtain, recent estimates suggest that around 8% of United States dental school graduates were originally trained overseas. The top source countries for dentists include India, the Philippines, and Colombia [3].

Given the sustained presence of internationally educated health professionals in the US health care system, it is important for state policymakers to understand the role of these professionals in North Carolina’s health care system. This article uses unpublished data from the 2008 North Carolina Health Professions Data System to examine the source-country profile and geographic distribution of the state’s internationally educated physicians, nurses, and dentists. It also discusses the role of each group in filling shortages in North Carolina and examines the broader implications of health professional migration for sending and receiving countries.

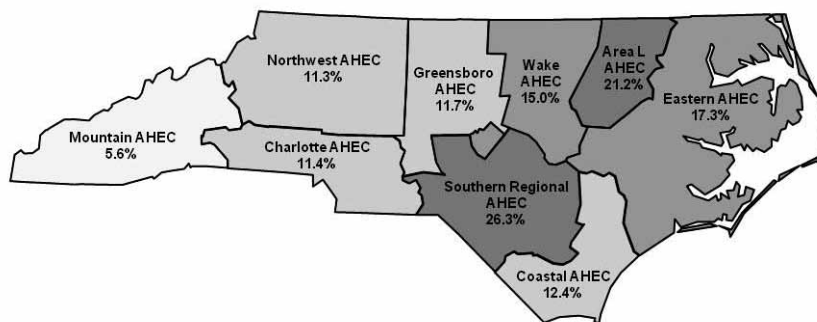
## Physicians

IMGs composed 13.4% of the active physician workforce (2,608 of 19,449 physicians) in North Carolina in 2008—a significantly smaller proportion than the national average of 25% [1]. The largest source countries were India (23.6% of IMGs and 3.2% of all active physicians—the only country

to supply more than 1% of North Carolina’s physician workforce), Canada (6.0% of IMGs), the United Kingdom (5.4% of IMGs), and the Philippines (4.4% of IMGs). The profile was similar to national statistics, although with smaller overall numbers. Also worth noting is the fact that 2.9% of North Carolina’s IMG physicians were educated in Grenada; it is likely that many of these were US citizens who were educated at offshore medical schools [4].

The geographic distribution of IMGs within North Carolina, by Area Health Education Center (AHEC) region, is shown in Figure 1. The percentage of IMGs varied from 5.6% (90 of 1,598 physicians) in the Mountain AHEC region in western North Carolina to 26.4% (310 of 1,177 physicians) in the Southern Regional AHEC region. The region with the

**Figure 1.** Percentages of Physicians Who Are International Medical Graduates, by Area Health Education Center (AHEC) Region



Note. Percentages are based on unpublished data from the 2008 North Carolina Health Professions Data System.

largest number of IMGs was the Wake AHEC region in central North Carolina, with 610 IMGs (15.0% of 4,112 total physicians). Although the Area L region in northeastern North Carolina had a relatively high percentage of IMGs (21.2%), the overall number of IMGs was the smallest of any region (86 of 406 physicians).

The geographic distribution of IMGs is likely influenced by visa provisions that privilege immigrant physicians willing to work in shortage areas. Since they are required to complete residency training in the United States, most IMGs enter this country on J-1 training visas, whose hold-

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ers are required to leave the United States for 2 years before they can apply to return [5]. However, IMGs who serve in federally designated health professional shortage areas can waive the return-home requirement under the Conrad J-1 Visa Waiver Program [6], which allows state health departments to request 30 visa waivers annually for IMGs working for approved employers. Federal agencies such as the Department of Health and Human Services and the Appalachian Regional Commission (a federal-state partnership) can also request waivers [7]. Program requirements vary by state; under North Carolina's Conrad Program, 10 visas may be requested for specialist physicians, whereas 20 are reserved for primary care physicians (ie, those working in family practice, internal medicine, pediatrics, and obstetrics/gynecology).

Although it has not used all of its Conrad Program slots in recent years [8], North Carolina has been relatively successful in retaining IMGs through a variety of channels. The state's IMG retention rate is greater than its retention rate for US medical graduates and greater than the median state retention rate for IMGs [9]. Besides J-1 visa waivers, IMGs who work in shortage areas can pursue residency in the United States through the labor certification or national interest waiver processes. The labor-certification process gives residency to IMGs whose employers can demonstrate a shortage of qualified workers to fill the position. IMGs who work at least 5 five years in medically underserved areas are also eligible for residency through national interest waivers, which are given to immigrants with unique abilities that contribute to the country's quality of life [10].

## Nurses

IENs composed 2.9% of North Carolina's active registered nurse workforce (2,496 of 86,896 nurses) in 2008—just over half the national average of 5.6% [11]. The largest source countries were Canada (38.7% of all North Carolina IENs and 1.1% of all North Carolina nurses), the Philippines (30.9%), the United Kingdom (4.9%), and India (4.4%). North Carolina is the third largest destination state for registered nurses who trained in Canada, likely because it offers reciprocal licensure for Canadian nurses [12]. Migration of Canadian nurses to the United States is also facilitated by increased visa eligibility under the 1994 North American Free Trade Agreement (NAFTA) and easier credentialing under the Rural and Urban Health Care Act of 2001 [13].

The distribution of IENs in North Carolina by AHEC region is shown in Figure 2. The percentage of IENs in each region's workforce ranged from

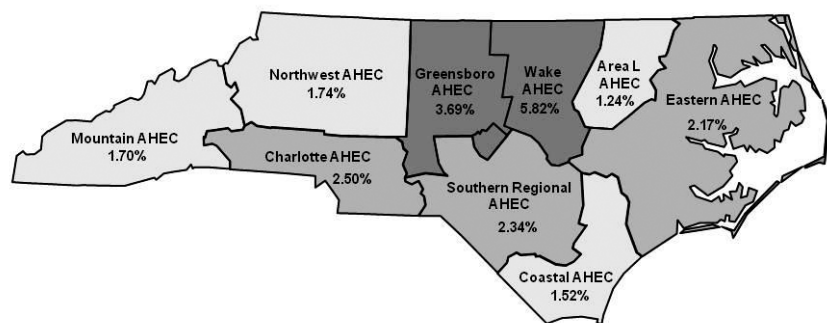
1.2% (30 of 2,418 registered nurses) in the Area L region to 5.8% (928 of 15,958 registered nurses) in the Wake region, which also has the largest overall number of IENs. The geographic distribution of IENs did not appear closely correlated with the distribution of IMGs. For example, the Area L region had the second-highest percentage of IMGs and the lowest percentage of IENs, while the Greensboro region had a below-average percentage of IMGs and the second-highest percentage of IENs.

This dissimilarity could be related to the fact that visa policies for IENs are less explicitly concerned than IMG visa policies with placement in shortage areas. Only the H-1C visa category (established under the Nursing Relief for Disadvantaged Areas Act of 1999) is specifically intended to place IENs in underserved areas in the United States, and the program involves a very small number of nurses and employers. Only 1 North Carolina hospital was eligible for the H-1C program, which expired in 2009 [14]. The other temporary visa categories for IENs (H-1B, renewable 3-year visas for workers with bachelor's degrees; and TN, renewable one-year visas for Mexican and Canadian workers linked to NAFTA [15, 16]) can be used by employers in any setting. Because all of these categories are restrictive, many employers seek to hire IENs on permanent (EB-3) immigrant visas, a process that is slowed by numerical quotas and long backlogs despite the fact that nurses are on a list of preferred professions for visas [17].

## Dentists

Internationally educated dentists composed 0.75% of North Carolina's dental workforce (30 of 3,987 dentists) in 2008. All were trained in North America—15 each in Canada and Puerto Rico. Figure 3 shows their geographic distribution by AHEC region. Most internationally educated dentists are located in the Eastern, Area L, and Charlotte AHEC regions. The number of internationally educated dentists is very small because, unlike physicians and nurses, they are required

**Figure 2.**  
Percentages of Nurses Who Are Internationally Educated, by Area Health Education Center (AHEC) Region



Note. Percentages are based on unpublished data from the 2008 North Carolina Health Professions Data System.

to complete degree programs accredited by the American Dental Association (ADA) before they can work in the United States [18].

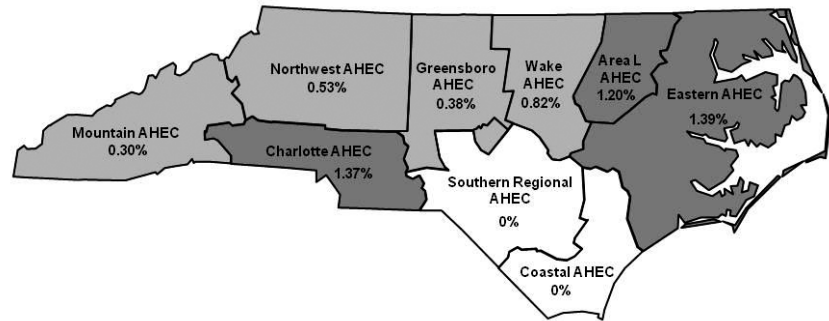
North Carolina's Dental Board allows graduates of overseas dental schools to apply for licensure after completing at least 2 years of dental school, earning a degree at an ADA-accredited dental school, and passing written and clinical examinations [19]. Although some United States dental schools offer shortened degree programs for internationally educated dentists, the University of North Carolina School of Dentistry (North Carolina's only dental school) requires them to enter its doctor of dental sciences program as first-

year students. The School of Dentistry's recently published *Carolina 2010* academic plan indicates that the school intends to develop an accelerated program for internationally educated dentists, as well as alternative pathways to licensure for internationally educated dentists willing to work in shortage areas [20]. When implemented, these initiatives could make the licensure process less burdensome for internationally educated dentists in North Carolina and provide them with new avenues to fill gaps in the state's dental care system.

### Policy Implications

International migration of health professionals is a long-standing phenomenon that is likely to continue for many years into the future. Although they offset staffing shortages and fill critical gaps in receiving countries, it is important to remember that the departure of large numbers of health professionals can exacerbate shortages in sending countries, a particular problem for developing countries that can ill afford lost investments in education and diminished health system capacity. Some receiving countries (eg, the United Kingdom) have established concrete ethical recruitment policies to counteract these negative effects [21], but the United States has not, leaving the responsibility of balancing ethical concerns with staffing needs with individual employers. US health workforce planners must carefully

**Figure 3.** Percentages of Dentists Who Are Internationally Educated, by Area Health Education Center (AHEC) Region



Note. Percentages are based on unpublished data from the 2008 North Carolina Health Professions Data System.

consider how meeting domestic needs can place burdens on other countries' health care systems and workforce supplies.

A related concern is the fact that, although international recruitment of health care professionals helps health care organizations meet current needs, it does not address the underlying conditions that contribute to health professional shortages in the United States—insufficient educational capacity, high turnover (especially in nursing), and other issues. Policy changes intended to address domestic supply issues have come from the American Association of Medical Colleges, which has recommended increases in medical school and graduate medical education enrollment in order to address a perceived shortage of physicians [22]. Legislation, such as the 2002 Nurse Reinvestment Act and the 2010 Affordable Care Act, aim to improve recruitment and retention of nurses through loan repayment, education vouchers, and retention grants [23, 24]. Although their overall effects on the role of internationally educated health professionals in the United States health care system are still unclear, these measures reflect a growing awareness that the future of our health system depends on strong domestic education systems, as well. **NCMJ**

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**Odds of a child becoming a top fashion designer: 1 in 7,000**

**Odds of a child being diagnosed with autism: 1 in 110**

**Some signs to look for:**

No big smiles or other joyful expressions by 6 months.	No babbling by 12 months.	No words by 16 months.
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**To learn more of the signs of autism, visit [autismspeaks.org](http://autismspeaks.org)**




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# Why Global Health Matters to North Carolina: Effects of the Global Health Sector on North Carolina's Economy

*Kim Chapman Page, Adrian Garcia-Mosqueira, Sui Tang, Charles Becker*

**T**he state of 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, and promote programs and activities to improve global health. The global health industry has become a considerable driver of economic activity in North Carolina. Measurement of the effect of this industry was the primary objective of a study recently conducted by a team of researchers at Duke University [1].

The businesses, organizations, and educational institutions that are involved in the global health sector are generators of significant economic activity in North Carolina and have measurable and sizable effects on the state's economy. The Duke University study is timely and relevant because it examines a sector that increases in importance as North Carolina continues to strengthen its relationships with the international community in the areas of manufacturing, trade, research, and humanitarian service. The ability to quantify the size of the global health sector across the state is key to realizing its value. This economic effect is of particular relevance to policymakers as they make decisions that will affect the investment priorities and globalization of North Carolina's economy.

Over the past decade, there has been a palpable surge in global health awareness, engagement, and activity, especially in academic institutions but also in nonprofit organizations, industry, government, and the general public. At the federal level, the President's Emergency Plan for AIDS Relief (PEPFAR), established in 2003 under the Bush administration, holds its place in global health history as the largest effort by any nation to combat a single disease. Building on the successful aspects of PEPFAR, the Obama administration has called for spending of \$63 billion over 6 years as part of the more comprehensive, "whole of government" Global Health Initiative. This initiative will continue robust funding of efforts targeting human immunodeficiency virus and acquired immunodeficiency syndrome, but it will also focus on broader global health challenges, including mater-

nal and child health, family planning, and neglected tropical diseases, through a more integrated approach to fighting diseases, improving health, and strengthening health systems.

Closer to home, leading universities such as Duke University, North Carolina State University, and the University of North Carolina (UNC)-Chapel Hill have all established institutes or formal programs that are dedicated to training the next generation of global health scholars and practitioners. As an emerging academic discipline, global health involves highly interdisciplinary and interconnected areas that include human and animal health, medicine, law, engineering, economics, environmental science, agriculture, and the social and biological sciences. This trend is seen at universities across the country, with new programs being established at such a rate that the Consortium of Universities for Global Health has incorporated to set standards, develop networks, and advocate for global health curricula in the United States and Canada.

Inspired by the work of Beyers and colleagues [2], who estimated the economic effect of global health on the economy of Washington State, Duke University researchers used an inclusive approach to account for economic activity generated by North Carolina's labor market, including analysis of data from nonprofit organizations, academic institutions, and industry output [1]. Global health activity, for the purpose of this study, was limited to the efforts of organizations based in North Carolina that actively seek to improve health conditions and eliminate health disparities in low-income and lower-middle income countries. Therefore, the study's estimates are conservative, representing a reliable *floor* of the true economic effect of global health activity in the state. The study analyzed economic data from 2007, the latest year for which complete data are available. However, there continues to be tremendous growth in global health activity in North Carolina, and the total economic effect has likely grown substantially over the past 3 years.

The data were broken down into the following 3 sectors: for-profit, which includes private and public businesses;

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nonprofit, which includes entities that are tax-exempt, such as charitable organizations and research institutions; and academic, which includes the economic effects of global health research at colleges and universities statewide [1]. In each of these groups, the effect of global health activities was calculated using an input-output model that measures economic effect in terms of employment, income generated, output, and tax revenue [3]. Economic effects were divided between direct effects and indirect effects. Direct effects are the immediate effects of global health activity on a given economic region, such as labor requirements or the value of a medical procedure produced by an entity engaged in global health. Indirect effects, generated by IMPLAN (IMPact analysis for PLANning [4]) multipliers, are the effects of global health activities on supporting industries that are necessary for global health activities, such as the construction of centers and laboratories that undertake global health research.

The study had several important findings [1]. First, in 2007, North Carolina's global health sector supported more than 7,000 jobs and \$508 million in salaries and wages. The effect of global health on the state's economy ranged from \$1.7 to \$2 billion.

Second, the strongest contributor to global health is North Carolina's nonprofit sector. Nonprofit organizations, defined as charities, nongovernmental organizations, and research institutions, together yielded 3,400 jobs, \$267 million in salaries and wages, and more than \$1 billion in total business activity. One of the largest contributors in North Carolina is RTI International, which is headquartered in Research Triangle Park, one of the oldest and largest science parks in North America. In 2007, RTI International received more than \$216 million in grants (representing 35% of their total revenue) from the US Agency for International Development for projects related to women's reproductive health, neglected tropical diseases, and malaria eradication [5].

Third, North Carolina's academic community also contributes significantly to global health, with nearly \$51 million in total business activity in 2007. Duke University and UNC Chapel Hill account for roughly 90% of the global health activity among the state's academic institutions. The most

significant contributors within these institutions are the Duke Global Health Institute and the UNC Gillings School of Global Public Health.

Finally, other notable considerations include the effect of North Carolina's pharmaceutical and research industries on global health. These areas represent the top 2 contributors among for-profit enterprises, followed by medical-apparatus manufacturing. The exports of most of these companies go to South Africa, Mexico, Brazil, Russia, and Turkey. In 2007, the total for-profit sector supported 3,000 jobs in global health, generated \$220 million in salaries and wages, and yielded \$591 million in total business activity.

How do these effects compare to North Carolina's economy as a whole? Global health is a modest, but growing sector of the state economy. In 2007, North Carolina had the ninth largest economy among US states, with a gross domestic product of \$400 billion and exports worth \$4.6 billion to countries with low and low-middle incomes. Exports to countries with low and low-middle incomes accounted for approximately 20% of North Carolina's total exports across all goods and services. North Carolina's labor force is composed of approximately 5.4 million workers out of a total population of 9.06 million people. Although the annual per capita income in North Carolina is estimated to be \$34,952, the mean annual salary in the global health sector is \$36,042, making it a higher-paying option for workers.

The global health sector is a significant and growing industry in North Carolina, and its relevance and economic effects continue to increase. The findings from the Duke University study verify that the global health sector provides thousands of jobs and economic benefits to the state while improving lives and reducing health disparities around the world. North Carolina's commitment to improving health conditions and eliminating health disparities is marked by its significant and tangible investment in global health, which improves the lives of underserved populations around the world, as well the lives of the citizens of North Carolina. The results of this economic analysis demonstrate the prominence—and promise—of the global health sector and suggest that North Carolina is once again transforming its economic landscape to reflect the importance of our global connections worldwide. NCMJ

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# Global Health Is (Local) Public Health

Margaret E. Bentley, Gretchen Van Vliet

In a world where nations and economies are increasingly interdependent—whether through the continuing globalization of the economy, ongoing demographic changes, or the rapidly rising costs of health care in various countries—illness in any population affects all people. The health of the world's population has become increasingly interconnected because disease does not recognize borders. As Brown and colleagues [1p62] remarked, "'Global health,' in general, implies consideration of the health needs of the people of the whole planet above concerns of particular nations."

In a recent article titled "Global Health Is Public Health," several deans of top-tier schools of public health, including the University of North Carolina (UNC) Gillings School of Global Public Health, asserted that "public health schools remain at the forefront of efforts to educate global health experts who are prepared to confront the global burden of disease" [2p536]. The title of the article reflects the philosophy of UNC's school of public health that global health and public health are indistinguishable and that global health is also *local* health.

The school of public health at UNC-Chapel Hill officially became the Gillings School of Global Public Health in Fall 2008 in recognition that, even at a public, state institution, *all health is global*. Initiatives undertaken since the name change have attempted to redefine public health education, including ensuring that all public health students understand how domestic and international problems and their solutions are interconnected and require collaborative, interdisciplinary teamwork. In a 2004 review of UNC's school of public health, the Association of International Educators noted that "global health is integrated across departments, programs, and centers and emphasizes the linkages between problems and solutions in developing countries and in industrialized, Western settings" [3p58]. This allows for an interdisciplinary approach to the study and teaching of both local and global health.

UNC-Chapel Hill has made "internationalization" and global health a priority, leading to the 2007 establishment of the UNC Institute for Global Health and Infectious Diseases, directed by Myron S. Cohen, the J. Herbert Bate Distinguished Professor of Medicine, Microbiology, and Public Health. This institute fosters an environment in which faculty, students, and the broader university community

work together in unique and innovative ways to address critical issues in global health and to shape the next generation of global health leaders across the campus. In this article, we provide several examples of UNC-Chapel Hill's research and education, to illustrate why global health is local health.

## Water, Sanitation, and Hygiene

UNC-Chapel Hill has a strong reputation in water research, both domestically and internationally. Starting in the 1950s, faculty at UNC's school of public health have worked in North Carolina and worldwide on water issues. The first major international effort outside of the United States was led by Daniel Okun, who established a sanitary engineering program in Lima, Peru, in the 1950s [4]. Projects based outside of North Carolina helped faculty at the school of public health realize "its commitment to better the health of all the world's peoples" [4p84]. Today, there are over 20 faculty members in the Department of Environmental Sciences and Engineering who have expertise in water, sanitation, and/or hygiene. Under the leadership of Dean Barbara Rimer, the school of public health has made water a strategic priority at UNC-Chapel Hill, including the establishment of a new UNC Water Institute, led by renowned global water expert Jamie Bartram. The Water Institute will coordinate water research and programs at the school of public health, at UNC-Chapel Hill, and across the state to make access to clean drinking water a reality for millions of people worldwide.

**Engineers Without Borders (EWB).** The Daniel A. Okun Chapter of EWB, located at UNC-Chapel Hill, is particularly strong. This group of dedicated students from departments across the campus is involved in projects to improve community water systems at the local level in areas such as Moldova, Peru, as well as in their own community of Chapel Hill.

The partnership between EWB and the Rogers Road community, a historically black neighborhood in Chapel Hill, began in January 2009, when the community sought help from EWB to identify issues about possible contamination related to the nearby local landfill. Since then, EWB students have administered surveys to assess household water and sewer infrastructure and have tested the quality of community drinking and surface water [5]. The Orange County

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Health Department also tested the water and found that 9 of 11 wells were below US Environmental Protection Agency standards for water quality. EWB's ongoing efforts in this community include analyzing the results of water tests; studying odor, air quality, and health; engaging in a continuing dialogue with local, state, and federal governments to convey concerns about the environment; and organizing service projects to clean up the environment and improve living conditions.

In addition to its efforts in the Rogers Road community, the Daniel A. Okun chapter has been working in Moldova as part of the National Guard State Partnership Program that formally links North Carolina and Moldova. This summer, a group of students from the Department of Environmental Sciences and Engineering and the Department of Health Behavior and Health Education will return to Moldova to provide hygiene education to 2 schools in Moldova that is based on results of surveys students conducted on water and sanitation during the past 2 summers. In January 2008, former US Ambassador to Moldova Michael Kirby and current North Carolina Secretary of State Elaine Marshall asked UNC's school of public health to join the partnership to provide guidance in public health-related matters. The EWB project is just one of several initiatives that resulted from this original request.

**Point-of-use water filters.** Mark Sobsey, professor of environmental sciences and engineering, is internationally renowned for his research, teaching, and service in water, sanitation, and hygiene, with an emphasis on microbiology and virology. His research has addressed domestic and international water issues, ranging from swine wastewater in North Carolina and the southeastern United States to safe storage of drinking water in developing countries. Sobsey's work on sustainable point-of-use water filtration systems has led to the WaterSHED initiative, funded by the US Agency for International Development. This is a public-private partnership designed to bring effective, affordable water and sanitation products to market in Cambodia, Laos, and Vietnam.

Sobsey was invited to participate in the first LAUNCH event in March 2010, a program jointly sponsored by NASA, the US Agency for International Development, the US State Department, and Nike. He presented a proposal to the 30-member LAUNCH council that involves use of simple, accessible, affordable tests to assess water quality and safety. The council is a diverse and collaborative group of entrepreneurs, venture capitalists, scientists, engineers, and leaders in government, media, and business who will advise Sobsey and other presenters about how to move their innovations forward into commercial production, field deployment, and use.

## Infectious Diseases

The infectious diseases epidemiology group in the Department of Epidemiology at UNC's school of public

health has particular strengths in human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) research worldwide. Infectious diseases epidemiologists work to improve surveillance, identify newly emerging infections, understand transmission dynamics, and develop and evaluate prevention and control strategies.

Infectious diseases experts from public health and medicine programs at UNC-Chapel Hill are addressing the HIV epidemic through research and clinical treatment via projects underway in North Carolina and in regions such as Africa and Asia. In 2005, UNC-Chapel Hill researchers published a groundbreaking article that demonstrated a new method to rapidly diagnose acute HIV infection among HIV-positive individuals living in North Carolina [6]. Identification of HIV infection at the acute stage is key because HIV transmission is most likely during this period. This new test was then assessed for efficacy in Lilongwe, Malawi, and it is currently being adapted for use in sub-Saharan Africa [7].

The UNC Project-Malawi, based in the capital city of Lilongwe, has a mission to "identify innovative, culturally acceptable and relatively inexpensive methods of reducing the risk of HIV and [sexually transmitted disease] transmission through research; strengthen the local research capacity through training and technology transfers; and to improve patient care for people living with HIV and AIDS" [8]. Faculty from the UNC School of Medicine and UNC's school of public health address issues ranging from mother-to-child transmission of HIV to HIV transmission as it relates to nutrition and breastfeeding.

**HIV infection in North Carolina's African American population.** Disparities in the prevalence of HIV infection and AIDS in the United States are well-known and well-documented. Ada Adimora, an associate professor of medicine who has an adjunct appointment in the Department of Epidemiology at UNC's school of public health, participated in a 2009 meeting at the White House with the Office of National AIDS Policy and the Council on Women and Girls that addressed the disparate rates of HIV infection and AIDS among the African-American population in the United States. Her research focuses on heterosexual transmission of HIV in the African American population in North Carolina and the southeastern United States.

In a recently published article, Adimora and colleagues cited Centers for Disease Control and Prevention (CDC) data estimating "that 45% of new HIV infections in the US in 2006 occurred among non-Hispanic blacks" [9p468], which greatly exceeded the incidence of transmission among whites in the United States during that period. Adimora recognizes that the lack of a preventive approach to the HIV epidemic in the United States has contributed to the disparities in the burden of HIV infection across racial lines. "The reasons for the nation's failure to control the epidemic among African Americans include the prevailing paradigm for HIV research and prevention" [9p470], which does not address relevant social factors. The research agenda for

the African American population with regard to infections due to HIV and other sexually transmitted pathogens must be “placed within a social determinants and social justice framework” [10p338], according to Adimora and colleagues, to approach prevention in a more integrated manner that includes upstream issues such as education and housing.

**Severe acute respiratory syndrome (SARS).** The 2003 SARS epidemic is a dramatic example of why global health is also local health. The epidemic spread rapidly from Asia to areas around the globe, primarily because of transcontinental airline travel, and almost 800 individuals died from the infection [11]. Ralph Baric, professor of epidemiology, had for years conducted research on the *Coronavirus* genus, of which the virus that causes SARS is a member. He and his research team synthetically reconstructed the bat variant of the virus for the purpose of developing a vaccine for the virus [12]. The only US case of SARS, contracted by a UNC employee who had traveled to Canada, was treated at UNC Hospitals.

## Global Obesity

It is widely recognized that the United States is experiencing a rapidly expanding epidemic of obesity and associated chronic diseases [13]. The North Carolina Division of Public Health reported that, in 2007, the prevalence of obesity among North Carolina children was the fifth highest in the country, with 20% of children aged 10-17 years overweight and 14% obese [14]. In the same year, more than 64% of adults in North Carolina were overweight or obese. It is now also clear that what is being seen in North Carolina is part of an obesity pandemic, with high obesity rates documented in China, India, Brazil, Mexico, and many other developing and transitional economy countries. Research at UNC-Chapel Hill has tracked diet and obesity trends around the world over the past 2 decades [15]. Barry Popkin, professor of nutrition and leader of the Interdisciplinary Obesity Research Center at UNC-Chapel Hill, recently published a book for laypersons that describes the causes and possible solutions to address the problem [16]. More than 65 UNC-Chapel Hill faculty members work on obesity and diabetes research and prevention across the state and around the world. Projects cover the life span and involve tracking of obesity during infancy among African American families [17, 18], among children aged 3-5 years in day care [19], among adolescents with type II diabetes in North Carolina and the United States [20], and among adult women in rural North Carolina settings who are at high risk for obesity and diabetes [21, 22].

## Community Preparedness

**North Carolina partnerships with Moldova and Botswana.** The National Guard State Partnership Program links US states with partner countries. This program represents “an evolving international affairs mission for the North Carolina National Guard using the unique civil-military nature of the Guard” [23]. Activities in the program include bilateral consultations, civic leader visits, and medical and humanitarian

exchanges. The North Carolina-Moldova partnership was formalized on April 22, 1999; the North Carolina-Botswana partnership was formalized in February 2008.

Bill Gentry, director of the Community Preparedness and Disaster Management program in the Department of Health Policy and Management at UNC’s school of public health, accompanied the North Carolina National Guard on a mission to Moldova to promote regional cooperation and interoperability between nations in the Black Sea region. Gentry has played a vital role in this local-global link through his efforts to help facilitate and evaluate a multinational disaster-awareness exercise that included participants from Moldova, Ukraine, Romania, Azerbaijan, Bulgaria, Georgia, Armenia, and Turkey. Gentry recently began working on the new state partnership with Botswana, traveling there in March 2010 for a training event with the Botswana Defense Forces.

**Public health preparedness in North Carolina and worldwide.** The CDC-funded UNC Center for Public Health Preparedness, based at the North Carolina Institute for Public Health, is part of a national network of centers with the mission to improve the capacity of public health agencies and their staff through research, educational programs, and technical assistance. The center works primarily with US-based agencies. Staff members have also consulted on projects around the world, including a program in Southeast Asia to train influenza rapid-response teams, courses and modules on field epidemiology in Central America, and influenza surveillance in Europe, the Middle East, and Africa.

## Microfinance and Health

An innovative study called Seeds of Hope is underway in eastern North Carolina to adapt global models of microfinance [24] to improve the health and economic status of women. Seeds of Hope arose from associations UNC-Chapel Hill researchers have had with women in Duplin and Sampson counties in North Carolina since the early 1990s. Led by Marci Campbell, professor of nutrition at UNC’s school of public health, the first objective of Seeds of Hope was to help women start a business that “that will serve as a laboratory for women to learn and practice the entire constellation of skills required for planning and running a business and to develop a business plan for a socially responsible, sustainable, and healthy woman-run small business in Duplin and Sampson Counties” [25p1123]. The business the women developed is called Threads of Hope, and it uses skills they gained through employment in the textile industry before textile companies moved their production facilities overseas. This approach of linking business skills with health education “embodies the belief that if women have economically sustainable work, are paid a living wage, and have more control over their lives economically, their health will improve” [25p1123].

There is additional work being done by faculty at UNC’s school of public health that looks at international examples of how microfinance can improve the health of participants.

The Gillings' gift to the school of public health supports 2 Gillings Innovation Labs on microfinance, including one that funds research by Suzanne Maman in the Department of Health Behavior and Health Education that analyzes the role microfinance and leadership training can have on men, especially young men who are most vulnerable to contracting or spreading HIV [26].

## Conclusion

UNC-Chapel Hill has a long tradition of involvement in global health projects, beginning with work undertaken by

public health researchers in the 1950s in water and sanitation and including a 20-year history of infectious diseases work in multiple countries, as well as local and global research in nutrition and obesity. Because of the interconnectedness of national and international health concerns, health care education, whether in medicine, public health, pharmacy, or nursing, should incorporate global perspectives and interdisciplinary approaches to ensure that practitioners understand the implications of living and working in a global community [27]. Indeed, global health is public health, and global health is local health. **NCMJ**

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# North Carolina and the Evolving Global Health Policy Agenda

Benjamin Mason Meier, Kristen Nichole Brugh

**G**lobal 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. This article addresses the role of the United States in global health policy and analyzes the paths through which this role impacts North Carolina.

## The United States in Global Health Policy

The United States has become a leading actor in the global health architecture, with US policy holding sway over morbidity and mortality in much of the world. In the past decade, global health has become an explicit goal of US policy, with legislation, regulations, executive orders, and policy statements framing and guiding US funding, activities, and programs to address public health abroad [1]. At the intersection of foreign policy and health policy, this role is poised to grow under the Obama administration, with the President's Global Health Initiative (GHI) set to reframe and coordinate US action for global health.

**The United States in the global health architecture.** The United States has long held a prominent role in the global health architecture under the aegis of the United Nations. As a leading progenitor of the World Health Organization (WHO)—echoing US development support to build a healthy world out of the ashes of the Second World War—the United States has sought to use global health policy to alleviate human suffering [2]. Through these postwar institutions for global health governance, consisting of both the international organizations that exert influence in global health and the norms that govern the relationships among them, the United States would seek to promote, restore, and maintain health in an increasingly globalized and interconnected world.

From the very start of this international framework for global health policy, however, the strategic interests of the United States would pose increasing threats to WHO's legitimacy. With US policymakers suspicious that WHO would seek to advance "socialized medicine," the United States sought to employ its budgetary leverage during the Cold War to influence global health governance, pressing WHO

to set a medically focused agenda of "impact projects" to advance US foreign policy interests [3]. As the United States repeatedly cut its contributions specific to WHO's work in global health policy [4], Western scholars lamented that "in an era of cold war politics...public health has come to be subjected to cold war rhetorics...and this politics of public health has come to be centered on the international organization which was specifically created to promote international cooperation" [5p115]. Despite fleeting US support for global health policy in the 1970s [6], the 1980 election of President Ronald Reagan—and with it, principled opposition to WHO's regulatory activities—would limit opportunities for WHO to hold sway in global health governance [7].

With the modern institutions of global health governance now 60 years old, the nature of this global system has changed considerably as the United States has shifted its global health priorities [8]. Given a leadership vacuum in global health governance, the global health architecture has begun to shift toward greater US hegemony in global health policy, with commentators increasingly noting that "the US domestic agenda is driving the global agenda" [9]. As the Group of Eight leading industrialized countries created the Global Fund to Fight AIDS, Tuberculosis, and Malaria in 2001, it became clear that the United States was moving to create parallel institutions over which it would have greater control [10]. Under a post-9/11 security paradigm, the United States began to focus on global health through the lens of national security, unwilling to delegate substantive health authority to international organizations [11]. By moving away from a model of working through international institutions for global health governance, the United States is bypassing multilateral organizations and pursuing an ambitious expansion of its role in bilateral health assistance, increasingly making US foreign policy a singular force for global health.

**US policy and global health.** In this new architecture for global health, US foreign policy holds predominant influence in disease prevention and health promotion. The United States is the largest donor for global health in absolute dollars (albeit less dominant relative to its gross domestic product), and foreign health assistance is fast becoming an anchor of US soft power, answering nations' call for strong

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global health leadership in a post-Cold War world. Whereas the United States' role was once defined by uncoordinated medical approaches to select high-profile diseases, it is moving toward coordinated foreign assistance to government systems for the public's health.

At the heart of US health diplomacy efforts in the aftermath of the Second World War, US support for WHO paled in comparison to the tens of millions of dollars in foreign health assistance to Western European governments under the Marshall Plan, criticized at the time as "give-away' health projects set up on an expensive, so-called emergency basis" [12p397]; to Latin American republics through the Pan American Sanitary Bureau, stabilizing "friendly" governments throughout the Western hemisphere [13]; and to developing states under President Truman's 1949 "Point IV Program," providing technical assistance in health care as a fundamental role of US foreign policy [14]. This US assistance became grounded in the containment of communism, reconceptualized for health with "the open recognition, as a basis for national action, of the fact that communism breeds on filth, disease, and human misery" [13p1474]. By continuously framing health diplomacy as an effort to combat the "unsatisfactory living conditions on which Communism feeds" [15p1479], the United States would seek to influence minds as much as bodies through foreign health assistance, focusing on immediately effective and highly visible medical interventions as a means of "quieting unrest" in regions susceptible to communist influence [13].

Carried forward by the US State Department, the 1961 establishment of the US Agency for International Development (USAID) galvanized foreign assistance for public health, administering technical and economic assistance to develop institutions for health in the developing world [2]. To plan and carry out these health reforms, USAID has assumed responsibility for a number of foreign policy health initiatives, retaining global health authority despite increasing State Department oversight and congressional criticism [16]. Working alongside these State Department programs and the Millennium Challenge Corporation, the President's 2003 Emergency Plan for AIDS Relief (PEPFAR) has made the State Department's Office of the Global AIDS Coordinator the principal mechanism of US global health funding [17]. Yet in spite of an ambitious commitment to establish and increase funding to programs for the care and treatment of human immunodeficiency virus (HIV), a 7-fold increase in US government spending that rivals any other national effort in global health, PEPFAR's early reliance on medical services led to programs that "crowded out" public health systems and constrained governmental health policies in the developing world [18]. Despite burgeoning efforts to address HIV, malaria, and other high-profile diseases, these fragmented and shifting US efforts have been criticized for their lack of coordination across government agencies, attention to health systems, and a strategy for foreign assistance.

However, as ethical considerations and human rights claims have renewed attention to the plight of the world's poor [19], the United States has moved to refocus foreign assistance for global health. With then-Senator Barack Obama having called for strengthening global health programs during his presidential campaign, advocates pressed the Obama presidential administration to maintain the global health funding approved by his predecessor while distributing that funding in accordance with a comprehensive strategy for US engagement with global health [20]. Given this call for revitalized US leadership—a call that grew stronger as the global financial crisis decimated global health [21]—the Institute of Medicine of the National Academies considered sustainable strategies for US health diplomacy, concluding that the United States should engage more deliberately in global health leadership [22].

To reshape foreign health assistance across US agencies, programs, and partners, the Obama administration's GHI seeks to develop a comprehensive strategy to integrate and organize US global health initiatives. By focusing on public health systems, "GHI will help partner countries improve health outcomes through strengthened health systems, with a particular focus on improving the health of women, newborns, and children through programs including infectious disease, nutrition, maternal and child health, and safe water" [23p4]. The initiative builds on existing disease-specific efforts (with 70% of funds earmarked for PEPFAR, notwithstanding a stabilization in the level of HIV funding), seeking to shape how the US government coordinates its resources across global health activities and engages with international partners and developing countries to meet 9 targets for global health (Figure 1) through adherence to 7 key principles (Figure 2) [23].

While it is unclear to what extent this foreign policy effort will meet its targets and principles for health system strengthening, initial coordination among agencies—promoting GHI's promise to develop sustainable "country-led

**Figure 1.**  
**Global Health Initiative Targets for Global Health**

- \_\_\_\_\_
- HIV/AIDS**
- \_\_\_\_\_
- Tuberculosis**
- \_\_\_\_\_
- Malaria**
- \_\_\_\_\_
- Maternal health**
- \_\_\_\_\_
- Child health**
- \_\_\_\_\_
- Nutrition**
- \_\_\_\_\_
- Family planning and reproductive health**
- \_\_\_\_\_
- Neglected tropical diseases**
- \_\_\_\_\_
- Health systems strengthening**
- \_\_\_\_\_

Note. AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

**Figure 2.**  
**Global Health Initiative Key Principles**

<b>Women- and girl-centered approach</b>
<b>Strategic coordination and integration</b>
<b>Strengthen and leverage other global efforts</b>
<b>Encourage country ownership</b>
<b>Promote sustainability through health system strengthening</b>
<b>Improve metrics, monitoring, and evaluation</b>
<b>Encourage innovative research</b>

platform[s]" for health—has begun to identify areas in which the United States could have the greatest impact on public health outcomes [24]. With \$63 billion set aside for this initiative over a 6-year period and intensified efforts and focused resources for 20 nations under a "GHI Plus" framework, the GHI will seek to prioritize government efforts to reach the most-effective and most-efficient improvements for public health, viewing these improvements in public health as a means to achieve economic development in the developing world [25].

### Global Health Policy for North Carolina

These changes in US global health policy will greatly influence North Carolina organizations and institutions, with North Carolina policymakers holding key positions in shaping that policy for the state, the nation, and the world. Global health policy is inextricably linked to North Carolina's major institutions, with the Research Triangle housing leaders in global health innovation at both national and international levels. As a focus of the state's nonprofit organizations, academic and research institutions, and private industries, global health policy is, increasingly, an opportunity for state innovation.

#### *Implications of US global health policy for North Carolina.*

With annual funding of more than \$2 billion [26], North Carolina, in partnership with state industries, nongovernmental organizations, and academic institutions, is uniquely poised to serve as a leader in the early development and sustained implementation of the GHI. As global health policy transitions to support public health systems, state organizations bring long-standing experience to the implementation of this new strategy. Many North Carolina institutions are already recognized leaders in the 9 GHI target areas and have long based their missions and operating procedures on the themes of the 7 key GHI principles [23]. These institutions, which often accomplish their goals with federal support, include nongovernmental organizations such as IntraHealth International (available at: <http://www.intrahealth.org>), which has promoted health system strengthening through a focus on human resources for health and workforce capacity building; academic settings such as the University of North

Carolina–Chapel Hill, where the Carolina Population Center's MEASURE Evaluation project (available at: <http://www.cpc.unc.edu/measure/>) has developed research in metrics, monitoring, and evaluation and has provided technical leadership for health data needs to improve program planning, health information, and government systems; and private companies such as Futures Group, which has pursued evidence-based consulting solutions to developing countries in reproductive health and infectious disease.

Given that North Carolina organizations and institutions have long led the way in global health innovation, reinforced by a new federal initiative that largely promotes their existing goals and priorities, GHI's global health architecture should present additional opportunities for the state. This will also hold true for the GHI Plus strategy, as North Carolina-based global health programs are currently underway in countries throughout the developing world, ranging from sub-Saharan Africa to Central America, that are eligible for GHI Plus benefits. With increased federal support for public health systems-based approaches to solving global health problems, North Carolina's nongovernmental, academic, and private institutions will enjoy greater collaborative opportunities for further health innovation through the Triangle Global Health Consortium (available at: <http://triangleglobalhealth.ning.org>) and with other national and international global health programs.

**North Carolina's influence on US global health policy.** As this evolution in global health policy takes place, North Carolina policymakers will continue to shape key components of the GHI, holding instrumental roles in its planning, implementation, monitoring, and evaluation. At the federal level, North Carolina is actively involved in discussions on the importance of global health policy to the state. North Carolina is represented by 2 senators and 13 representatives, and several of these legislators, particularly Senator Kay Hagan and Representative David Price, are engaging with key global health actors from the state. Yet despite this support for global health and the overwhelming role of North Carolina institutions in promoting global health innovation [24], North Carolina's congressional delegation has done comparatively less to advance these interests by way of sponsoring or cosponsoring bills or resolutions in the Senate and House of Representatives. In examining the legislative record, none of the 25 active bills or 7 resolutions from the 111th US Congress are sponsored by North Carolina legislators, and few have received cosponsorship from these policymakers (Table 1).

This lack of legislative support for US foreign health assistance and North Carolina global health institutions presents a missed opportunity in global health policy, as the state's congressional leaders have a direct role to play in the success of the GHI by approving budget requests, installing accountability procedures, and setting standards to guarantee the sustainability of GHI investments. Given this historic transition in the United States' approach to global health, complemented



**Table 1.**  
**Global Health Policy Bills and Resolutions in the 111th US Congress, 2009-2010**

Title	No.	Summary	Cosponsors, no.			
			Overall		NC legislators <sup>a</sup>	
			S	HR	S	HR
Bill						
21st Century Global Health Technology Act	S.1591; H.R.3560	Establishes a Health Technology Program in USAID to research and develop technologies to improve global health	1	25	0	0
Global Child Survival Act of 2009	S.1966	Provides assistance to improve health of newborns, children, and mothers in developing countries	10	...	0	...
Global Food Security Act of 2009	S.384; H.R.3077	Authorizes appropriations for FY2010-FY2014 to foreign countries to promote food security, stimulate rural economies, and improve emergency response to food crises	16	82	0	2 (BM, DP)
Global HEALTH Act of 2010	H.R.4933	Establishes coordination for all US health-related foreign assistance, assists developing countries in health service delivery, and establishes initiatives to strengthen indigenous health workforces	...	19	...	0
Global Health Care Cooperation Act	S.3135	Enhances global health care cooperation	0	...	0	...
Global Poverty Act 2009	H.R.2639	Requires the president to develop and implement a comprehensive strategy for the reduction of global poverty, elimination of extreme poverty, and achievement of the Millennium Development Goals	...	6	...	0
Global Resources & Opportunities for Women to Thrive Act of 2009	S.1425; H.R.5191	Increases US financial and programmatic contributions to further economic prospects for women in developing countries	21	12	1 (KH)	0
Global Sexual and Reproductive Health Act of 2010	H.R.5121	Promotes sexual and reproductive health of both individuals and couples in developing countries	...	38	...	1 (DP)
Global Service Fellowship Program Act of 2009	S.589	Directs the USAID administrator to establish a Global Service Fellowship Program to fund fellowships and establishes the Office of Volunteers for Prosperity	5	...	0	...
Improvements in Global Maternal and Newborn Health Outcomes while Maximizing Successes Act	H.R.5268	Authorizes the president to furnish assistance to improve maternal and newborn health in developing countries; inclusive of HIV/AIDS prevention programs  Directs the president to implement a comprehensive strategy to reduce mortality and improve the health of mothers and newborns in developing countries as part of the Global Health Initiative	...	74	...	1 (DP)

Title	No.	Summary	Cosponsors, no.				
			Overall		NC legislators <sup>a</sup>		
			S	HR	S	HR	
<b>Bill</b>							
Increasing America's Global Development Capacity Act of 2009	S.355	Enhances US capacity to carry out global development activities	7	...	0	...	
International Protecting Girls by Preventing Child Marriage Act of 2009	S.987; H.R.2103	Prevents child marriage for the protection of girls in developing countries	40	108	2 (RB, KH)	3 (BE, BM, DP)	
International Violence Against Women Act of 2010	S.2982; H.R.4594	Combats international violence against women and girls	31	118	0	1 (LK)	
International Women's Freedom Act of 2009	S.230; H.R.606	Establishes an Office of International Women's Rights within the Department of State	0	17	0	0	
Microfinance Capacity-Building Act of 2009	H.R.1987	Directs USAID to provide grants to eligible private nonprofit microfinance institution networks that serve the poor and very poor in developing countries	...	19	...	0	
Newborn, Child, and Mother Survival Act of 2009	H.R.1410	Provides assistance for newborn, child, and maternal health improvement in developing countries	...	94	...	3 (BM, DP, LK)	
Roadmap Act of 2009	H.R.2817	Establishes the White House Office on Global Hunger and Food Security and the Permanent Joint Select Committee on Hunger to address global hunger and improve food security	...	37	...	0	
Senator Paul Simon Water for the World Act of 2009	S.624; H.R.2030	Provides 1 million people with first-time, sustainable access to safe drinking water and sanitation by 2015	33	78	1 (RB)	2 (GB, MW)	
<b>Resolution</b>							
Supporting the goals and ideals of World Malaria Day, and reaffirming the United States leadership and support for efforts to combat malaria as a critical component of the President's Global Health Initiative	S.RES.499	...	10	...	0	...	
Supporting the goals of World Tuberculosis Day to raise awareness about tuberculosis	S.RES.454	...	0	...	0	...	
Recognizing the disproportionate impact of the global food crisis on children in the developing world	H.CON.RE S.11	...	...	0	...	0	

Title	No.	Summary	Cosponsors, no.				
			Overall		NC legislators <sup>a</sup>		
			S	HR	S	HR	
Resolution							
Expressing the sense of Congress that the United States should provide, on an annual basis, an amount equal to at least 1% of US gross domestic product for nonmilitary assistance programs	H.CON.RE S.63	...	...	15	...	0	
Recognizing the disparate impact of climate change on women and the efforts of women globally to address climate change	H.CON.RE S.98	...	...	39	...	1 (GB)	
Expressing the sense of Congress that Africa is of significant strategic, political, economic, and humanitarian importance to the United States	H.CON.RE S.128	...	...	44	...	0	
Recognizing Project HOPE for 50 years of exceptional service to improve and save the lives of children and adults in developing nations through humanitarian assistance and health education	H.RES.666	...	...	14	...	0	

Note. Data are current as of September 1, 2010 [27, 28]. No initiatives were sponsored by a North Carolina legislator. AIDS, acquired immunodeficiency syndrome; BE, Bob Etheridge; BM, Bradley Miller; DP, David Price; GB, George Butterfield; FY, fiscal year; HIV, human immunodeficiency virus; HR, US House of Representatives; KH, Kay Hagan; LK, Larry Kissell; MW, Melvin Watt; RB, Richard Burr; S, US Senate; USAID, US Agency for International Development.

<sup>a</sup> Legislators are specified in parentheses.

by the multiple interests of state institutions, North Carolina's congressional delegation has an opportunity to lead the effort to promote the GHI through global health policy reform.

## Conclusion

There is an imperative in North Carolina to create policy

frameworks to guide innovative programs in global health. With the rapid evolution in global health policy, the need has never been greater to rethink how the state endeavors to meet global health needs, with an emphasis on viewing its stakeholders as key actors in the global health architecture and viewing its policies as medicine on a global scale. NCMJ

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# Call to Action on Breastfeeding in North Carolina: Review and Rationale

Miriam H. Labbok, Emily Taylor

**W**hen one looks at many preventive health practice norms, one might conclude that North Carolina has a unique “health care personality.” The norms in North Carolina do not quite fit with regional norms in the southeastern United States, nor do they align with those of the Mid-Atlantic states. North Carolina’s attitudes, trends, and practices related to the protection, promotion, and support of breastfeeding are no exception. North Carolina has a special set of issues that affect trends and practices in breastfeeding and vary across the state.

Breastfeeding is sometimes referred to as the “homeless intervention.” It has no commercial home. It is neither entirely a women’s issue nor entirely a children’s issue. Breastfeeding is not a one-time thing, like an immunization or a pill; rather, it demands a 24/7 commitment on the part of new parents who have many things to learn. However, it is a mistake to think of breastfeeding as simply a lifestyle choice. In the United States, we once considered avoidance of smoking, use of a seat belt or a bike helmet, and regular exercise to be lifestyle choices with no real public health impact. However, we have been persuaded by data on health and survival, as well as by the social and health care costs of nonadherence to public health recommendations, to value these preventive health behaviors and to support them with social marketing campaigns, insurance incentives, and even laws to increase acceptance and to promote behavior change.

These considerations also apply to breastfeeding. Breastfeeding is a vital preventive health practice and an issue for all who care about health, whether from a clinical, business, or personal viewpoint. The support, or lack thereof, for breastfeeding

has measurable implications in terms of lifelong health and wellness for North Carolinians.

## Does Breastfeeding Really Matter for Children’s Health?

Breastfeeding guidelines provided by the American Academy of Pediatrics recommend exclusive breastfeeding for the first 6 months of life and continuation of breastfeeding for the first year and beyond as long as mutually desired by mother and child [1]. Human milk contains all the nutrients that infants need for optimal growth and development; infants receive a mix of carbohydrates, fats, proteins,

**Table 1.**  
US, North Carolina, and Southeast Regional Breastfeeding Initiation Rates and Continuation Rates at 6 and 12 Months of Age

Variable	Initiation, %	6 months, %	12 months, %
United States, total	73.4	41.7	21.0
United States			
Hispanic	80.4	45.1	24.0
White, non-Hispanic	74.3	43.2	21.4
Black, non-Hispanic	54.4	26.6	11.7
North Carolina			
Hispanic	84.6	48.1	23.3
White, non-Hispanic	72.4	39.5	20.1
Black, non-Hispanic	49.3	19.5	11.3
Southeast region <sup>a</sup>			
Hispanic	70.8	37.3	17.5
White, non-Hispanic	66.0	32.8	14.9
Black, non-Hispanic <sup>b</sup>	43.4	20.1	7.4

Note. Data are from [6].

<sup>a</sup>Unweighted average for Alabama, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, Virginia, and West Virginia.

<sup>b</sup>West Virginia is not included because of small sample size.

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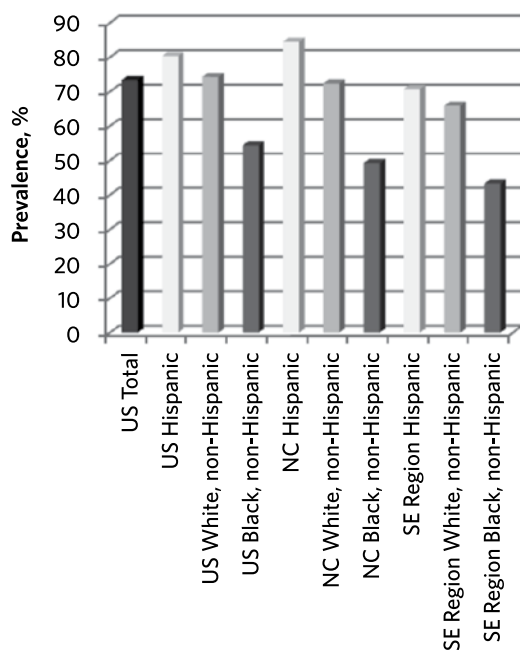
**Emily Taylor, MPH, CD (Dona)**, senior project director, Carolina Global Breastfeeding Institute, Department of Maternal and Child Health, UNC Gillings School of Global Public Health.

and micronutrients, as well as literally hundreds of different types of cells, immune factors, oligosaccharides, enzymes, hormones, and other factors. However, breastfeeding (ie, feeding directly at the breast) offers even more: the milk composition is continually changing to best satisfy the nutritional and immunologic requirements of the child, which vary according to age and environment [2]. The additional factors in human milk have a profound impact on the health of the child. A recent systematic review and meta-analysis that included data only from the United States and other industrialized countries identified many conditions where the lack of breastfeeding has been associated with adverse health outcomes among infants, including increased mortality and morbidity due to increased sepsis, necrotizing enterocolitis, pneumonia, sudden infant death syndrome, skin reactions, diarrhea, infections, overweight, cardiac risk factors, and diabetes [3]. Lack of breastfeeding has also been associated with lower IQ scores and delayed visual development. Because breastfeeding helps infants overcome environmental problems they might face at birth, optimal breastfeeding can be called the “Great Equalizer” because it has the potential to give every baby the best start in life.

### Does Breastfeeding Really Matter for Maternal Health?

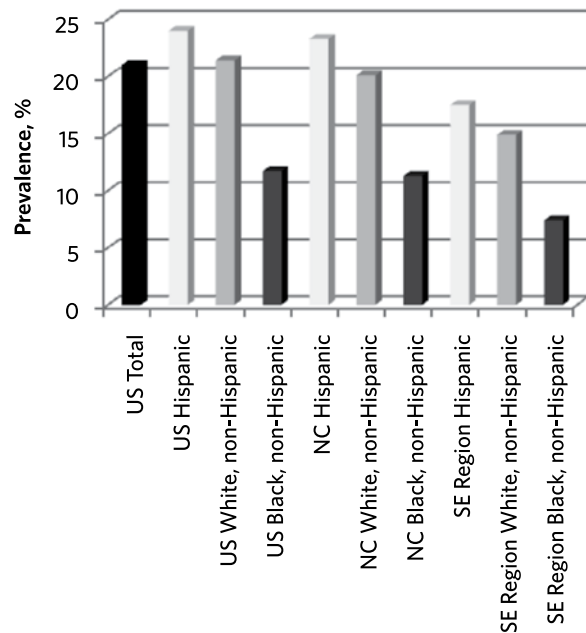
Mothers also experience adverse health outcomes if they do not breastfeed. Not every woman is able to breastfeed, and many factors, both social and physical, can come

**Figure 1.**  
US, North Carolina, and Southeast Regional  
Breastfeeding Initiation Rates, by Race/Ethnicity



Note. Data are from [6]. NC, North Carolina; SE, southeast.

**Figure 2.**  
US, North Carolina, and Southeast Regional  
Breastfeeding Continuation Rates at 12 Months  
of Age, by Race/Ethnicity



Note. Data are from [6]. NC, North Carolina; SE, southeast.

between a woman’s decision and the final feeding outcome. Nonetheless, for a woman to make an unbiased informed decision, she must be aware of the impact of breastfeeding on her own health.

The review by Ip and colleagues [3] found that non-breastfeeding mothers experience slower postpartum recovery, increased maternal stress and postpartum blood loss, slower uterine involution, more rapid return to fertility, and increased risk for diabetes and breast, ovarian, and uterine cancers, as well as possible increased risk for osteoporosis and postpartum depression. Moreover, not breastfeeding increases the financial burden of infant feeding for parents and for the nation [4] and forces parents to purchase infant feeding products. Exclusive breastfeeding, by comparison, is a free, sustainable, and sterile nutritional source for the baby [5].

### What Are the Trends and Disparities in Breastfeeding in North Carolina?

Nationwide, the prevalence of breastfeeding initiation and continuation to infant ages of 6 and 12 months has been reported by state, race, and ethnicity [6]. Table 1 and Figures 1 and 2 present data for the nation and North Carolina, as well as the unweighted average for Alabama, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, Virginia, and West Virginia. The pattern for North Carolina is more

similar to the US pattern than to that of other southeastern states. Rates of exclusive breastfeeding in North Carolina also are more similar to national than to regional rates. Table 2 presents the Healthy People 2010 goals, as well as the rates reported for 2009.

Despite the encouraging finding that the breastfeeding prevalence in North Carolina stands out in the region and approximates national averages, the state has major issues to address, including significant disparities in prevalence by county and by race/ethnicity. Figures 3 and 4, available only in the online edition of the *NCMJ*, illustrate that although much of North Carolina is achieving the Healthy People 2010 goals for the nation in terms of breastfeeding initiation, much of the state falls behind in terms of continued exclusive breastfeeding.

The non-Hispanic black population in North Carolina has an infant mortality rate that is more than twice that of the white population [8], and many causes of infant death could be prevented by increased breastfeeding. However, non-Hispanic blacks breastfeed at a much lower rate than the white population, even after adjustment for socioeconomic status and for use of the Women, Infants, and Children (WIC) nutritional assistance program. Clearly, this population would benefit from support designed to address their specific needs, culture, sensitivities, and access issues.

### Are There Health Care Changes and Practices That Would Enable Women to Breastfeed?

Increasingly, studies are finding that programs that comprehensively address all levels of the socioecologic model offer the best way to support complex behavior changes. Such a comprehensive approach was outlined in 1990 at the Innocenti Meeting in Italy [9] and is reflected in national [10] and North Carolina [11] breastfeeding policy statements. The North Carolina statement provides the following recommendations: (1) encourage the adoption of activities that create breastfeeding-friendly communities; (2) create a breastfeeding-friendly health care system; (3) encourage the adoption of breastfeeding-friendly workplaces; (4) assist child care facilities in promoting, protecting, and supporting breastfeeding; (5) advocate for insurance coverage by all third-party payers

**Table 2.**  
Healthy People 2010 Goals, US Prevalence, and North Carolina Prevalence of Exclusive Breastfeeding at 3 and 6 Months of Age

Variable	3 months, %	6 months, %
Healthy People 2010, national goal	40	17
United States, 2009	33.1	13.6
North Carolina, 2009	30.2	13.1

Note. Data are from [7].

### Figure 3. Breastfeeding Initiation Rates During 2006-2008, by North Carolina County

This figure is available in its entirety in the online edition of the *NCMJ*.

Note. Data are expressed as percentages (Pediatric Nutrition Surveillance System, unpublished data).

for breastfeeding care, services, and, when necessary, equipment; (6) use media, social marketing platforms, and public education programs to promote breastfeeding; (7) promote and enforce new and existing laws, policies, and regulations that support and protect breastfeeding; and (8) encourage research and evaluation on breastfeeding outcomes, trends, quality of care, and best practices.

The second recommendation calls for a breastfeeding-friendly health care system. To achieve this, the state must ensure that both system and services address breastfeeding. Hospitals may pursue the Ten Steps for Successful Breastfeeding in maternity settings [12], and health care workers may participate in continuing education opportunities on this subject. Materials to support curricular updates are also available online [13-15]. In addition, an international board-certified lactation consultant can help an institution or a private practice support all mothers in initiating and overcoming issues in breastfeeding, so that all mothers may engage in their desired breastfeeding practices.

### Why Would Any Clinician Not Actively Support Breastfeeding?

Let's face it: many of us are still doing what we were taught to do during our training, and that may not be up to date. Breastfeeding rates and breastfeeding research were both rarities from the 1960s through the early 1990s, when most of us, or most of our professors, were trained. The recent research on breastfeeding may seem confusing, and the translation of that research into practice can be difficult. For clinicians, the translation of best practices for feeding infants into support of normative patient behavior is met with many real and perceived barriers on all sides. A recent review of the literature on exclusive breastfeeding emphasized that families' feeding decisions may be influenced by a variety of factors during the preconception period, during pregnancy, during birth, during the postpartum period, during the return home, and thereafter [16]. There is no one health specialist with whom the mother is in contact throughout these periods, and furthermore, media, social, and work pressures may outweigh the best advice from a health care professional [16]. However, research has also found that consistent, supportive prompts and advice from physicians and primary care professionals during prenatal and perinatal care can have a profound influence on a woman's intention to breastfeed and on her breastfeeding success [12, 16, 17].

Why might a clinician not actively support breastfeeding for all clients? The clinician's lack of the basic knowledge or skills to support breastfeeding can play an important negative role. Cognitive dissonance—conflict or anxiety resulting from inconsistencies between one's beliefs and actions—may cause some practitioners to hesitate to actively support breastfeeding. Although most clinicians know that breastfeeding is beneficial, if a practitioner does not have the skills to support breastfeeding, the dissonance between what they believe and what they are able to do can lead to rationalization of inaction or inappropriate action. For example, when asked about breastfeeding, health care practitioners who are unsure of their skills may avoid the issue. A common avoidance tactic is self-relief from responsibility by stating first that “we must not cause guilt” in the mother who cannot breastfeed. This is a rationalization—the vast majority of mothers can produce milk, and clinicians actually often use guilt as a motivator for other healthy practices, such as dieting and exercise. The best way to support clinicians to translate breastfeeding support into practice and to overcome cognitive dissonance on this issue is to ensure that all health care workers have the opportunity, both before service and during service, to gain the knowledge and hands-on skills necessary to support breastfeeding.

### What Is Being Done to Enable All New Mothers to Engage in Their Desired Infant Feeding Practices in North Carolina?

North Carolina's public and private health systems are increasingly engaged in breastfeeding support. Health professional organizations in North Carolina have shown an increased interest in this issue; the North Carolina Child Fatality Task Force is actively supporting breastfeeding and will soon prioritize the issue of disparities, opening a door for additional targeted breastfeeding support; and the North Carolina Division of Public Health is implementing the WIC program's new service for exclusively breastfeeding mothers and, along with the North Carolina Hospital Association, initiated the new North Carolina Maternity Center Breastfeeding-Friendly Designation Program (available at: <http://www.nutritionnc.com/breastfeeding/breastfeeding-friendly.htm>), and offers mini-grants for breast-

#### Figure 4. Exclusive Breastfeeding Rates at 6 Months of Age During 2006-2008, by North Carolina County

This figure is available in its entirety in the online edition of the *NCMJ*.

Note. Data are expressed as percentages (Pediatric Nutrition Surveillance System, unpublished data). *Blue* indicates that insufficient data were available.

feeding support. Additional new and ongoing efforts include those of the North Carolina Breastfeeding Coalition (available at: <http://ncbfc.org/>), which supports the Golden Bow Initiative and the Business Case for Breastfeeding, and the Perinatal Quality Collaborative of North Carolina Human Milk Initiative (available at: <http://archive.constantcontact.com/fs084/1000843024260/archive/1103480805140.html>), which supports exclusive breast feeding throughout the hospital stay. Also, the Carolina Global Breastfeeding Institute at the University of North Carolina (UNC) Gillings School of Global Public Health initiated the Breastfeeding-Friendly Child Care Project, currently underway in Wake County; the Breastfeeding-Friendly Health Care Project, which is in hospitals across all perinatal care regions of North Carolina; and the Mary Rose Tully Training Initiative, the first clinical training program in lactation and breastfeeding located in a US health sciences center. Elsewhere, ongoing programs include work at YWCAs, such as those in Greensboro and Wake counties; community-engaged research by the UNC-Greensboro Center for Women's Health and Wellness; and the Durham Breastfeeding Education and Support Team Alliance, which involves community-based participatory research on breastfeeding among African American mothers in Durham County [18]. These projects, and the many other clinical, training, and service activities across the state, are expanding. Breastfeeding rates are increasing, but real change will occur only when breastfeeding, especially exclusive breastfeeding, again becomes the accepted and supported norm for healthy infant feeding. *NCMJ*

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# Linking Challenges, Sharing Solutions: The Global Crisis in Human Resources for Health

Barbara Stilwell, David Nelson

**N**orth Carolina's shortage and uneven distribution of health workers continues to garner attention, particularly in eastern counties, where rates of chronic disease are among the highest in the nation. As Dr. Paul Cunningham, dean of the Brody School of Medicine at East Carolina University, noted in a recent article, "I wonder why some of our doctors want to serve in Nicaragua, where there is a dire need, but they can drive through [eastern North Carolina] today [and see similar levels of need]" [1].

## Human Resources for Health (HRH): Global and Local Considerations

Without major improvement in the supply of health workers, North Carolina is projected to see a 26% decrease in the number of physicians per capita by 2030 and an 8% decrease in the overall number of primary care professionals (ie, physicians, nurse practitioners, physician assistants, and certified nurse midwives) [2]. At the same time, demand for health workers is expected to increase in the state as more residents obtain health insurance coverage through the passage of comprehensive health care reform legislation. The situation is compounded by the increasing size of the state's elderly population, the increasing average age of North Carolina's nurses (almost one quarter are expected to retire within 10 years), and the severe shortage of nursing faculty needed to expand nursing programs and train practitioners [3]. In addition, the current state of the economy has curtailed many plans for expanding enrollment in medical schools.

Globally, there is a shortage of more than 4 million health workers who are needed to provide access to vital health information, services, and commodities, and the World Health Organization (WHO) has designated 57 countries as facing a health worker crisis [4]. Shortages are exacerbated by maldistribution of health workers between rural and urban areas and among primary care versus specialist cadres.

IntraHealth International, a nonprofit organization that is based in Chapel Hill, North Carolina, and working in more than 30 developing countries, is a leader in the global field of human resources for health (HRH). IntraHealth directs *CapacityPlus*, the US Agency for International Development's

flagship project to strengthen the health workforce. One of IntraHealth's primary mandates is to expand and share evidence-based HRH approaches and to encourage sharing of solutions and lessons learned among HRH leaders and practitioners in developing countries.

Less attention has been devoted to considering global initiatives to strengthen HRH in the context of the health worker shortage in North Carolina. How can North Carolina's health care leaders learn from the international experience? Can these programs offer approaches or strategies that can be applied in North Carolina? Can the global situation inform policy in this state?

At the very least, it is important to understand that efforts to address the global and domestic health worker shortages are linked through the issue of migration. Program planners factor in international medical graduates when considering strategies and plans to recruit more health professionals to work in North Carolina and more physicians to train through the state's medical residency programs. On the other side of this equation, out-migration of these graduates from the developing countries where they were trained or that supported their education deprives these countries of their most qualified workers and trainers. When health systems are already fragile, the loss of trained health workers may leave the most-vulnerable people without health services.

Nevertheless, there are also benefits to health worker migration, including the workers' return of earnings to family members in their home country, improvements in experience and education among workers, and the creation of international networks. With the burgeoning opportunities for social networking through specialized Internet sites, jobs and courses are advertised formally and informally all over the world. The migration of health workers, especially nurses, is not new, but the trend in the past decade has been for richer countries to rely heavily on recruiting health workers from poorer countries rather than to improve their own recruitment and retention strategies.

Good health workforce planning is important for all health systems. In addition to migration, literature on the health worker situation in North Carolina highlights many of the same priority factors for strengthening HRH as the global agenda, including increasing the supply and roles of

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nonphysician clinicians; speeding up recruitment; addressing management practices, work environments, quality of life issues, and other factors to improve retention; attracting health workers to rural and underserved areas; exploring new models for community-level delivery of primary care; and balancing the supply of qualified personnel with prevailing demand for services.

## Addressing the Health Workforce in North Carolina

Although context is always an important consideration in developing and implementing intervention strategies to strengthen HRH, a number of approaches used by IntraHealth in its work in developing countries may be of interest to those involved in efforts to address the health workforce of North Carolina.

**Learning for Performance.** IntraHealth's *Learning for Performance* approach offers a step-by-step, customizable process and practical tools to focus health worker training and education on the specific job responsibilities and work environment of employees; to increase efficiency by removing unnecessary content; and to prepare learners for job performance by using experiential, competency-based training methods and by addressing the performance factors that determine whether new knowledge and skills can be used. IntraHealth has used this approach successfully in a number of countries and in a variety of contexts, often as a means of training health workers on the job without disrupting service delivery. The highly participatory nature of the approach has contributed to its success and has fostered teamwork, collaboration, and communication among managers, teachers, trainers, and supervisors, ultimately improving trainees' learning and performance.

**Task shifting.** There is global interest in task shifting—the rational redistribution of tasks among health workers—to improve productivity. In 2007, IntraHealth leadership participated in a collaborative meeting on this topic in Geneva, Switzerland, to assist the WHO with finalizing recommendations and guidelines for implementing task shifting in countries facing an HRH crisis and a high prevalence of human immunodeficiency virus (HIV) infection. The evidence that task shifting is an effective response to the shortage of health workers comes from developed countries. The United States and the United Kingdom have developed nursing roles and introduced nonphysician clinicians (resulting in task shifting) to extend health services to hard-to-reach populations and to reduce costs [5].

The *Learning for Performance* approach facilitates task shifting by tying learning to specific, identified job responsibilities and competencies. In Mali, IntraHealth put task shifting concepts into action. Because of a severe shortage of skilled birth attendants, most vaginal births, especially in rural areas, are attended by *matrones* (auxiliary midwives). However, the *matrones* were not authorized to perform active management of the third stage of labor (AMTSL) to prevent

postpartum hemorrhage, the leading cause of maternal mortality in the developing world. A pilot study showed that, after training in AMTSL, *matrones* were as adept as skilled birth attendants at performing the practice; consequently, the government has authorized *matrones* to perform AMTSL and has called for training them in the practice throughout the country.

Worldwide, millions of women lack access to modern obstetric care because there are not enough *qualified* health workers. Closer to home, in North Carolina, midwives could serve 20%-30% of the poor, rural, and/or minority mothers in the state who receive late or no prenatal care. Use of task shifting in North Carolina to ensure that midwives have a right to practice can expand access to care for people who need it most.

**Multiprofessional service-delivery teams.** The *CapacityPlus* project is developing a model to strengthen community-level primary health care through a team-based approach involving multiple cadres of health care professionals. These professionals include physicians, nurses, and community members who have been trained to provide services such as home-based treatment of malaria and family planning counseling. The model will incorporate task shifting and integrate community health workers as appropriate.

**Retention and productivity.** IntraHealth has performed a range of activities to increase knowledge about key factors affecting health worker productivity and retention and has helped countries design and test interventions to influence policies and improve service delivery. In Tanzania and Kenya, simple, low-cost work climate improvement initiatives improved morale and use of services in rural health facilities. These programs addressed factors such as management practices, facility-community linkages, relationships between patients and health workers, patient flow, safe protocols for infection prevention and waste disposal, and refurbishment of facilities and grounds.

At hospitals providing HIV-associated services in 6 Central American countries, IntraHealth and partners assisted national and regional management teams to better support and retain health workers through more-effective supervision. The approach allowed local teams to identify performance standards, to study their current performance, and to bridge identified performance gaps, including improving logistics systems, acquiring basic equipment, addressing stigma and discriminatory practices, and improving infection prevention practices.

Global resources for HRH practitioners may also be of value to agencies and organizations addressing similar issues domestically. The IntraHealth-led *Capacity Project* (the predecessor to *CapacityPlus*) played a key role with the WHO and the Global Health Workforce Alliance in developing the HRH Action Framework and Web site (available at: <http://www.capacityproject.org/framework/>), an international effort to bring a shared approach and resources to complex HRH issues at the country level. In addition,

the Capacity Project developed the HRH Global Resource Center (available at: <http://www.hrresourcecenter.org>), the world's largest online HRH collection designed to maintain a global exchange of HRH evidence, tools, and innovation.

## Conclusion

Whether in Namibia, Nicaragua, or North Carolina,

addressing the HRH crisis boils down to a central point: front-line health workers are the foundation of every health system. As IntraHealth Chief Executive Officer Pape Gaye puts it, "At the end of the day, no matter how many technologies and medicines are made available and partnerships formed, without skilled and supported health workers there to provide care to those in need, health will not improve." NCMJ

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# North Carolina and Global Reproductive Health: For Better and Worse

Patty Skuster, Merrill Wolf

Since the 1970s, North Carolinians have had an important, although sometimes conflicting, effect on the reproductive health of women in the developing world. North Carolina is home to several of the world's leading reproductive health organizations, which, collectively, have contributed to major improvements in the health and lives of women and families throughout the world. Ironically, however, a provision of US foreign policy that also has roots in North Carolina has significantly limited these beneficial contributions. This provision has especially impeded the work of organizations such as Ipas, which strive to reduce deaths and injuries due to unsafe abortions among women. Repeal of the provision is essential to future efforts by organizations in North Carolina and around the world to safeguard the reproductive health and rights of women everywhere.

In 1973, shortly after the US Supreme Court lifted legal restrictions on abortion in the United States with the seminal *Roe v Wade* case, Senator Jesse Helms (R-NC) introduced and Congress passed an amendment to the US Foreign Assistance Act that, even today, curtails the rights and jeopardizes the health of women in the developing world. While the better-known Mexico City Policy, also known as the Global Gag Rule, prohibited the US Agency for International Development (USAID) from funding foreign organizations working on abortion (even if the organizations used their own, non-US funds for abortion-associated activities), the Helms Amendment bans *all* US foreign aid for abortion (Table 1). In addition, whereas the Global Gag Rule has been imposed by all Republican presidents and rescinded by all Democratic presidents since Reagan by executive order, the Helms Amendment is reversible only by an act of Congress and remains in effect.

The harmful impact of the Mexico City Policy (named for the site of the international conference where it was announced) is well documented. The policy led to closures and cutbacks at clinics that were principal sources not only

of family planning but also of basic health services such as vaccinations. It depleted the capacity and effectiveness of organizations with the greatest expertise in providing reproductive health care and deprived many people of essential care [1]. Although the Global Gag Rule was rescinded in January 2009, confusion among both USAID grantees and staff and fear of losing US funding perpetuate its damage.

Because of its much broader purview and because it remains in effect today, the Helms Amendment has perhaps done even more damage than the Mexico City Policy. As noted above, the amendment bans the use of any US foreign aid funds in ways that could be construed as promoting the performance of abortion "as a method of family planning." Moreover, it is a ban on what *both* private organizations and governments can do with US aid funds.

Congressional approval of the Helms Amendment represented a conservative backlash against the *Roe v Wade* decision, as well as a marked departure from the United States' previous role in international reproductive health. Beginning in 1971, USAID's Office of Population funded a private laboratory to develop a nonelectric technique for uterine evacuation. Known as manual vacuum aspiration (MVA), this technique is used for abortion and to treat complications from unsafe abortion [2]. Shortly after the Helms Amendment passed, a group of researchers and others affiliated with the University of North Carolina at Chapel Hill created Ipas to complete the development of the tech-

**Table 1.**  
**Comparison of the Global Gag Rule and the Helms Amendment**

Global Gag Rule	Helms Amendment
Executive order, enacted by presidents	US law, enacted by Congress
Affects USAID recipients' use of their own, non-US funds	Affects US funds
Applies to foreign NGOs only	Applies to all recipients of US foreign assistance (including NGOs and governmental organizations)
Applies to USAID funding for family planning programs only	Applies to all foreign assistance

Note. NGO, nongovernmental organization; USAID, US Agency for International Development.

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nology with non-USAID funds. Ipas is now nearly 40 years old and has offices in 13 countries; it continues to distribute MVA technology, along with other reproductive health technologies, as part of its much broader mission to advance the reproductive health and rights of women around the world.

## Global Context

Access to safe abortion is a life or death issue for tens of millions of women in the developing world. Where women lack access to safe abortion, many resort to unqualified individuals to terminate unwanted pregnancies or to unsafe methods, such as ingesting laundry detergent; inserting sticks and knitting needles into the cervix; rough massaging or beating of the abdomen; and jumping from a dangerous height [3]. Globally, nearly 20 million women experience unsafe abortion every year, primarily in developing countries, and according to the most recent estimates from the World Health Organization, for 2008, approximately 47,000 women die annually [4]. Unsafe abortion accounts for approximately 13% of global deaths from complications of pregnancy and childbirth and for a much higher percentage in many developing countries [5]. Nearly 78% of deaths from unsafe abortion occur in Africa and Asia [5].

In the past 2 decades, there has been notable but insufficient progress on policies and programs that address this critical reproductive health issue. Beginning with the watershed 1994 International Conference on Population and Development, governments have affirmed in a series of United Nations conferences that unsafe abortion is a major public health concern, that governments should review laws that penalize women who seek abortion, and that health systems should train and equip health care workers to ensure that abortion is safe and accessible [6-8].

United Nations institutions also recognize the need to improve women's access to safe abortion and to decrease deaths and injuries. In 2003, for example, the World Health Organization published technical and policy guidance to assist health systems in making abortion safe and accessible, in accordance with national laws [9]. In addition, several United Nations Human Rights Committees have identified unsafe abortion as a human rights violation and have called on governments to improve access to safe abortion. Since 1995, 28 countries around the world have loosened legal restrictions on abortion [10-15].

The availability, accessibility, and quality of health care services that address unsafe abortion have also improved through the combined efforts of governments, nongovernmental organizations (NGOs), health care professionals, and women's groups. Such efforts have increased women's access to modern contraception to help prevent unintended pregnancy; to treatment for complications from unsafe abortions; and to safe abortion. But despite these and other commitments from governments and civil society, progress has not been as great as it could—and should—have been. The Helms Amendment is one important reason.

## Effects of the Helms Amendment

The United States is the largest bilateral donor of international family planning funds in the world, and its policies have a significant impact on governments, NGOs, and United Nations agencies working in the developing world. The Helms Amendment in particular has impeded their efforts to address unsafe abortion and has stifled discussion of the issue.

The amendment stipulates that US funds shall not “pay for the performance of abortions *as a method of family planning*” (emphasis added). Embedded in this phrase is the idea that there are situations in which abortion is *not* a method of family planning—one could minimally presume these to include rape, incest, or instances in which a woman's life or health is in danger. But overly cautious interpretation has in effect banned US funding for all induced-abortion services, including the cases discussed above. Many developing countries legally permit abortion in at least these circumstances; the amendment thus impedes governments' progress in making safe abortion available, as mandated by their own laws.

Furthermore, although the Foreign Assistance Act stipulates that it does not prohibit information or counseling about all pregnancy options, including abortion, in effect it does just that. Under current understanding of the Helms Amendment, neither health care workers nor staff of USAID-funded programs can include information on safe abortion—even when a woman's life is threatened—in counseling programs or in public-information programs funded by USAID.

The amendment also contributes to shortages of MVAs, which are recommended and widely used for postabortion care, of which emergency treatment of complications from unsafe abortion is one component [16]. USAID supports postabortion care and, thus, training health care professionals in the use of MVAs. But USAID will not use its funds to purchase these medical instruments—even though the agency's own reports have documented significant problems with MVA availability in the developing world [17].

Nepal provides one clear example of how the Helms Amendment undermines national progress in addressing unsafe abortion. Nepal liberalized its abortion law in 2002 to reduce maternal mortality and morbidity. The government has since worked with a range of partners to make safe abortion available throughout the country. Safe abortion is now available through the public health system in every one of Nepal's 75 districts. A recently approved plan authorizes auxiliary nurse-midwives to provide early abortion by means of drugs, and community outreach is underway to meet women's needs for information about family planning, safe abortion, and other reproductive health needs.

The Helms Amendment has proved to be a significant barrier, however. USAID-funded information on maternal mortality published by the Nepali government excludes mention of safe abortion. USAID-funded clinicians and community health workers who provide information about family

planning and contraceptive methods cannot counsel clients about safe abortion. Effectively, adherence to the Helms Amendment denies Nepali women information about and access to a legal, and often desperately needed, health care service.

Another way the amendment has hindered progress in addressing unsafe abortion is by stifling discussion of this critical issue at the global level. In the mid-1980s, for instance, USAID defunded *International Family Planning Perspectives*, a journal published by the New York-based Guttmacher Institute, because it deemed that 2 articles had advocated for abortion. One article simply identified illegal abortion as a cause of maternal mortality in Bangladesh, whereas the other reported that Tunisia had legalized the procedure. After the Guttmacher Institute filed a lawsuit, USAID conceded that the articles were “neutral” on abortion and agreed to reconsider funding the publication [18]. More recently, in 2008, administrators of the USAID-funded Popline, the world’s largest reproductive health database, made the word ‘abortion’ unsearchable because of concerns about inclusion of what USAID deemed abortion-advocacy materials. After publicity and ensuing protests, ‘abortion’ was reinstated as a search term, but the articles (from a magazine on abortion and human rights published by Ipas) remain banned from the database.

## Restrictions on Abortion Funding for Women in the United States

Domestic funding restrictions that parallel the Helms Amendment impose similar barriers to abortion for poor women in the United States. The 1976 Hyde Amendment and similar laws bar government funding for abortion in most cases, affecting women who depend on federal programs such as Medicaid, the Indian Health Service, and the armed forces for health care [19]. The recently enacted legislation to reform health care further extends abortion-related restrictions to private insurance companies participating in the government insurance exchange.

Federal restrictions on abortion allow funding for abortion in cases of rape and incest and when a woman’s life is threatened by a continued pregnancy. Seventeen states offer public funding through Medicaid for abortion in additional circumstances. North Carolina follows the Hyde

Amendment, restricting state Medicaid funding to abortion procedures that meet very limited criteria [19].

Until fairly recently, however, state leaders had shown more compassion for poor women. After enactment of the Hyde Amendment, North Carolina was the only state to establish a special State Abortion Fund (SAF), to which the legislature appropriated funds to ensure access to care for the poorest women. This action was consistent with the state’s progressive history on abortion rights, including its 1967 liberalization of the law to allow legal abortion in cases of medical emergencies, rape, and incest [20]. But although funding was initially strong, it was inconsistent through the years, reflecting political controversy and shifts in power. Since 1996, the SAF has effectively existed solely on paper, with restrictions that make its scant funds now almost entirely inaccessible.

During the 35 years since enactment of the Helms Amendment, millions of women have died and tens of millions more have suffered injuries and disabilities due to complications related to unsafe abortion. As the global community increasingly recognizes the need to make safe abortion available to women as a matter of both public health and human rights, the United States stands alone among donor governments in maintaining a law that violates these principles. At a minimum, the Obama administration should issue guidance encouraging less restrictive interpretation of the amendment, to allow funding for medical equipment needed for lifesaving postabortion care and for abortion in cases of rape and threats to a woman’s life or health. Under existing law, USAID can and should fund counseling on the full range of reproductive health options available to women, including abortion.

Through the ban on foreign aid for abortion that carries his name, Senator Helms created obstacles that continue to impede poor and otherwise vulnerable women around the world from obtaining potentially lifesaving reproductive health information and care. The Helms Amendment undermines the work of North Carolina-based global health organizations such as Ipas, which work to improve the reproductive health of women in the developing world. For the United States to exercise the global leadership it should in the area of international reproductive health, the amendment must be repealed. NCMJ

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# The Local/Global Connection: Partnering to Address the Sexual and Reproductive Health Needs of Latinos in North Carolina

Laura Villa-Torres, Florence M. Simán, Merrill Wolf

Ipas is a nonprofit organization that works around the world, with a focus on developing countries, to increase women's ability to exercise their sexual and reproductive rights and to reduce the number of abortion-related deaths and injuries. Ipas' multidisciplinary approach, refined over nearly 40 years of global experience, encompasses mutually reinforcing work in the areas of policy, research, and service delivery.

Several years ago, Ipas saw the opportunity—and the need—to “bring home” its global experience by addressing neglected sexual and reproductive health needs of North Carolina's fast-growing Latino population. In partnership with El Pueblo, a statewide nonprofit advocacy and public policy organization dedicated to strengthening the Latino community (available at: <http://www.elpueblo.org>), Ipas is now transferring lessons from its global work to benefit the local community in North Carolina. While confirming Ipas' understanding that women everywhere face significant obstacles in obtaining appropriate, accessible, and affordable information and services related to sexual and reproductive health, this local experience has yielded enriching insights for Ipas' international efforts.

## Reproductive Health Challenges Facing North Carolina Latinos

The Latino population in North Carolina is currently estimated to make up more than 7% of the state's total population. The number of Latinos in North Carolina increased by almost 400% in the past decade, making the state's Latino population one of the fastest growing in the nation [1-3]. In North Carolina, Latinos, especially those who have recently immigrated, are more likely than non-Latinos to live in poverty and to lack health insurance coverage [1]. Latinos face additional challenges in accessing health care, such as a lack of culturally and linguistically appropriate services and difficulty navigating an unfamiliar health care system. Recently, with more-restrictive immigration laws (including one barring persons without social security numbers from obtaining a driver's license) and an increased risk of deportation, many immigrants without legal documentation are more

afraid to drive and to use social and health services, even when their children who are US citizens are entitled to them.

Additional obstacles compound the ability of Latino youths to obtain comprehensive reproductive health information and services. Latino youths, as with most young people, have few youth-focused, affordable, and appropriate reproductive health services available to them and little if any access to comprehensive sexual education. These gaps in information and care are particularly important because the Latino population in North Carolina is relatively young; the median age is 24 years, and approximately 36% are 18 years old or younger. North Carolina has the 14th highest teenage pregnancy rate among US states and, in 2000, led the nation in the teenage birth rate among Latinas [4, 5]. In addition, the teen pregnancy rate among North Carolina Latinas is almost 4 times that among their white counterparts and twice that among their African American peers. North Carolina Latinos also have high rates of HIV infection and sexually transmitted diseases, which are only slightly less than those reported for African Americans [6].

In 2005, Ipas began to apply knowledge gained from its global efforts to address needs related to sexual and reproductive health among North Carolina's Latino population. For example, Ipas recognized the importance of partnering with a local organization that had strong relationships with and understanding of the population served. El Pueblo was the ideal partner, having worked since 1996 to further the interests and well-being of the Latino community in North Carolina. The organization's broad spectrum of activities includes leadership development, proactive and direct advocacy, education, and promotion of cross-cultural understanding in partnerships at the local, state, and national levels. Ipas' interest in addressing Latinos' sexual and reproductive health needs supported El Pueblo's long-standing focus on a wide range of health issues affecting this population.

Ipas and El Pueblo jointly designed a program focusing on Latinos residing in or near the North Carolina cities of Raleigh, Durham, and Chapel Hill that incorporates the results of a 5-county needs assessment [7]. The program's

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principal objectives involve increasing Latinos' knowledge of reproductive health issues, improving their access to related services, and increasing their capacity to advocate for reproductive health and rights. Initially, Ipas and El Pueblo focused on training adult lay health advisors (*promotoras*) as reproductive health educators and activists. Interested community members participated in a 10-session training program on reproductive health, developed and implemented in collaboration with the North Carolina Healthy Start Foundation and the Wake County Human Services HIV/STD Community Program, that increased participants' knowledge on topics such as anatomy, contraceptive use, prevention of unplanned pregnancy and sexually transmitted diseases, gender sensitivity, how to talk with children about sex, and reproductive rights as human rights. To date, 4 groups of *promotoras* totaling 30 individuals have completed the training program and gone on to educate other community members in many settings, including informal group and one-on-one interactions, community-based discussions about reproductive health issues, and health-related and cultural events. The core group of *promotoras* continues to grow as experienced participants enlist other community members and take the lead in training them.

Evaluation of the *promotoras* program and the feedback obtained throughout its implementation identified a need to focus efforts specifically on Latino youth, who, as noted above, face particular reproductive health challenges. In 2009, Ipas and El Pueblo launched *Derechos Sin Fronteras* (Rights Without Borders) to provide a core group of young Latinas and Latinos with the knowledge, experience, and advocacy skills to confidently address these critical issues and spark positive change within their communities (Figure 1). With support from a team of students from the University of North Carolina Gillings School of Global Public Health, Ipas and El Pueblo identified specific barriers to Latino

youths' access to reproductive health information and services. These obstacles include cultural taboos, knowledge gaps reflective of North Carolina public schools' abstinence-only sex-education curriculum, and more-practical matters, such as a lack of transportation and resources.

By using curricula adapted from the *promotoras* program and material and lessons from Ipas' work in Mexico and Central America, Ipas and El Pueblo have, during the project's first 18 months, trained approximately 40 Latinos and Latinas aged 10-19 years as peer educators and reproductive health activists. Similar to their older counterparts, these youth leaders have applied their new knowledge and skills in multiple ways and venues, resulting in significantly increased communication about reproductive health issues among Latino families involved with the program.

### Looking Ahead

Ipas and El Pueblo are encouraged by the results of their collaboration with the North Carolina Latino community and look to continue supporting community members in enhancing their reproductive health and rights. Both agencies have a cadre of young people educated about, trained in, and committed to sexual and reproductive health and rights, and they anticipate reaching many more people in the Latino community, especially young women and men, with age-, linguistically, and culturally appropriate information. Ipas and El Pueblo were especially excited to host, along with other partners, the inaugural Latin@ Youth Forum on Reproductive Health in Chapel Hill in October 2010. The event provided a safe space for youths to learn about reproductive health issues and to develop related advocacy strategies.

In addition, with the 2009 passage of the Healthy Youth Act, Ipas and El Pueblo are hopeful that all North Carolina youths, including those of Latino descent, will have easier access to accurate and comprehensive reproductive health information at school. An important emphasis of the *Derechos Sin Fronteras* program going forward will be to encourage Latino youths' advocacy and other efforts to ensure that this policy is effectively implemented in all North Carolina schools.

Ipas' collaborative work to address the reproductive health needs of North Carolina's growing Latino community has benefitted from and reinforced global lessons. Key among these lessons is the recognition that strong partnerships with community groups are essential to building trust among community members, including community leaders, parents, and other organizations. Ipas' local experience has also revealed that it is important to first focus on basic information, which demystifies and creates dialogue about sensitive issues such as gender and sexual orientation, and that considerable time is often necessary for these activities.

Finally, the work that Ipas and El Pueblo have done with North Carolina Latinos has strengthened the agencies' belief in the importance of supporting the development of young people's skills as advocates for reproductive health

**Figure 1.**  
**Logo Selected by Youth Participants in the**  
***Derechos Sin Fronteras* Program**



and rights. As in so many settings and cultures, adolescents have the greatest needs for reproductive health knowledge. Enhancing the ability of North Carolina adolescents to advocate for these needs is a critical first step in developing

the capacity for significant, long-term reproductive health advocacy among the state's Latino organizations and, more broadly, in increasing the visibility of the Latino population among decision makers. NCMJ

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### Eat Smart, Move More Health Tip



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What are low in calories, full of essential nutrients and can help reduce your risk for chronic diseases? Fruits and vegetables! Make fruits and vegetables half your plate at every meal and for every snack. Fresh, frozen, dried, canned—it all counts. Shake things up by enjoying a variety of colors to stay healthy and fit. Your body will thank you.

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[www.EatSmartMoveMoreNC.com](http://www.EatSmartMoveMoreNC.com)



# Advancing the Global Public Health Agenda With Commercial Clinical Research Infrastructure

*Kelly T. McKee Jr, Oren Cohen*

In 1967, the US surgeon general declared that “the time has come to close the book on infectious diseases” [1]. At that time, tuberculosis had become a rarity in the developed world, and the push to eradicate smallpox was just underway. Howard Martin Temin’s discovery of reverse transcriptase, which would lead to the identification of human retroviruses, would occur 3 years later. Although sporadic cases of human immunodeficiency virus (HIV) infection were likely occurring in Africa around 1970, it was not until the mid-1970s that substantial human-to-human transmission began in earnest.

In 2010, it is safe to say that infectious diseases are alive and well and will continue to be important causes of morbidity and mortality for the foreseeable future. Thanks to the wide availability of airline transportation and continued logarithmic growth of electronic connections and communications, the globe continues to shrink at breakneck speed. The pandemic of HIV infection and acquired immunodeficiency syndrome (AIDS) has ravaged sub-Saharan Africa and continues to spread on a global basis. Tuberculosis is resurgent, thanks in part to the shrinking globe and the HIV/AIDS pandemic. Malaria continues to take a million lives per year, many of them children. And 2009 saw the return of an influenza pandemic, which was caused by a molecular relative of the influenza virus that resulted in the killer pandemic of 1918.

North Carolina is at an interesting crossroads in global health. The standard of living in the state’s urban centers, which are leaders in finance, information technology, and biotechnology, is among the best in the nation. The concentration of universities and enterprises in or near Research Triangle Park, North Carolina, that are dedicated to clinical research and global health is particularly impressive, attracting investment and interest from around the world. In contrast, many of North Carolina’s rural residents have poor access to health care services, and education levels among economically disadvantaged students remain well below the national average [2]. Infant mortality rates in several counties in rural eastern North Carolina range from 15-17 deaths per 1,000 births, approximating rates in Jordan, Malaysia,

and Thailand [3]. Increasingly, parts of the developing world are looking like rural North Carolina with regard to disease prevalence [4]. The American soft drink and fast food industries are seeing unprecedented growths in sales in developing countries, and as these sought-after exports become more affordable to people in these areas, rates of obesity and diabetes have begun to soar. In India, the prevalence of diabetes is expected to increase by nearly 80%, from 2.8% to 5.0% of the population, between 2000 and 2030 [5]. In 2030, there will be approximately 79.4 million people with diabetes in India. Because diseases associated with poverty remain stubbornly prevalent in the developed world and diseases of affluence and opportunity continue to emerge in the developing world, it makes sense to investigate diseases and new treatments on a global scale via studies that accommodate as many relevant populations as possible.

Drug and vaccine development is a lengthy and expensive process, with clinical trials accounting for a substantial portion of the total costs of drug development. The complexity of trial design, the maze of regulatory requirements, the nuances and requirements of subject enrollment, and the logistics of coordinating the myriad moving parts intrinsic to large, multinational studies are some of the enormous challenges attendant to accurate and successful execution of clinical studies to determine the potential effectiveness of a drug or vaccine at the population level.

In the 1970s, the need for specialist clinical research organizations to address these complexities was recognized, and a new enterprise was born in North Carolina. Dennis Gillings, a professor of biostatistics from the University of North Carolina (UNC)–Chapel Hill, began providing statistical consulting services for firms in the pharmaceutical industry. From its earliest days in a trailer on the UNC–Chapel Hill campus, the concept that became Quintiles has grown into the largest biopharmaceutical services company in the world, with more than 20,000 employees in 60 countries. The global growth of the clinical trials industry mirrors the needs of the biopharmaceutical industry overall. In this regard, by 2007, more than 50% of clinical trial-associated activities were occurring outside of the United States

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[6]. Primary drivers of this trend include the medical need and large number of patients in other areas of the world, the availability of skilled clinical investigators in regions of emerging importance, the harmonization of regulatory requirements, and the lower costs associated with clinical research in other regions.

Several of the largest biopharmaceutical services companies have followed Quintiles in establishing significant global footprints consisting of networks of local hospitals, investigators, laboratories, and ancillary support services to effectively coordinate and manage clinical trials. Increasingly, these footprints have expanded to the developing world (Table 1).

The resources, capabilities, and reach developed by organizations such as Quintiles for the wide range of studies conducted by the biopharmaceutical industry also have obvious appeal for drug and vaccine developers with products of potential benefit in the developing world. Biopharmaceutical companies, government agencies, and nongovernmental organizations seek to capitalize on these capabilities to avoid establishing stand-alone infrastructures, to mitigate the risk of poor or inadequate study execution, to ensure quality and ethical behavior, and, ultimately, to contain development costs. Indeed, Quintiles created a public health and government services business several years ago to meet these needs. Quintiles and similar providers of clinical services partner with numerous government, for-profit, and not-for-profit organizations in providing essential background epidemiological information, local infrastructure access, and clinical trial services to advance the development of products and better tailor the delivery of licensed products to users.

Quintiles has a particularly strong presence in sub-Saha-

ran Africa, having worked extensively in the region for more than 10 years. Quintiles has leveraged its infrastructure for local capacity building and to achieve public health objectives. Studies of experimental drugs and vaccines for prevention of HIV infection, tuberculosis, and malaria have all been successfully conducted in the region. Studies of neglected diseases, such as leishmaniasis and hookworm infection, have been conducted in other developing regions, including India and Latin America. Expanding the scope of clinical research in the developing world has been made possible by the efforts of governments, commercial organizations, nongovernmental organizations, academic medical institutions, and local communities and investigators. Partnerships are abundant, and some involve government agencies. Notable examples include the US National Institute of Allergy and Infectious Diseases and the University of Bamako in Mali, the University of Alabama-Birmingham and the University of Zambia, and Howard Hughes Medical Institute and the University of KwaZulu-Natal in South Africa. Quintiles has established partnerships with the University of Pretoria in South Africa and with the University of Ghana at the Noguchi Memorial Institute for Medical Research. In addition, the Bill and Melinda Gates Foundation funds an enormous amount of clinical research in the developing world, both directly and indirectly through partnerships and alliances. Many benefits come from these partnerships, including access to experimental treatments and vaccines by local populations with medical need, expansion of research capacity, cross-cultural scholarly activities, and employment and other economic stimuli. Ultimately, a major goal is the development and approval of safe and effective products for local populations in need. Biopharmaceutical services companies are valuable partners in achieving this objective, as they were created specifically to support efficient navigation of the drug-development process, with utmost attention to regulatory compliance.

Involvement in clinical research in the developing world raises the bar for proper ethical stewardship. Clinical staff and monitors must be well versed in International Conference on Harmonization Good Clinical Practice guidelines, the ethical principles for clinical research delineated in the Declaration of Helsinki, and local regulations. Although biopharmaceutical services companies are not directly involved in the informed-consent process, it is a critical focal point with regard to protection of vulnerable populations. Quintiles has trained hundreds of African investigators and onsite staff in the principles of good clinical practice, including issues associated with informed consent, and these efforts are now expanding around the newly established offices in Ghana and Kenya. Quintiles has also undertaken a long-term empowerment initiative in the form of a 6-month clinical research associate apprenticeship program, to address issues related to racial and gender inequality in the region. Funded by Quintiles and targeting previously disadvantaged individuals with appropriate qualifications but no

**Table 1.**  
**Quintiles Operations in Selected Countries in the Developing World**

<b>Country</b>	<b>Year operations began</b>
South Africa	1990
Brazil	1997
China	1997
Estonia	1997
India	1997
Russia	1997
Thailand	2000
Peru	2003
Vietnam	2005
Indonesia	2006
Egypt	2007
Ghana	2009
Kenya	2010

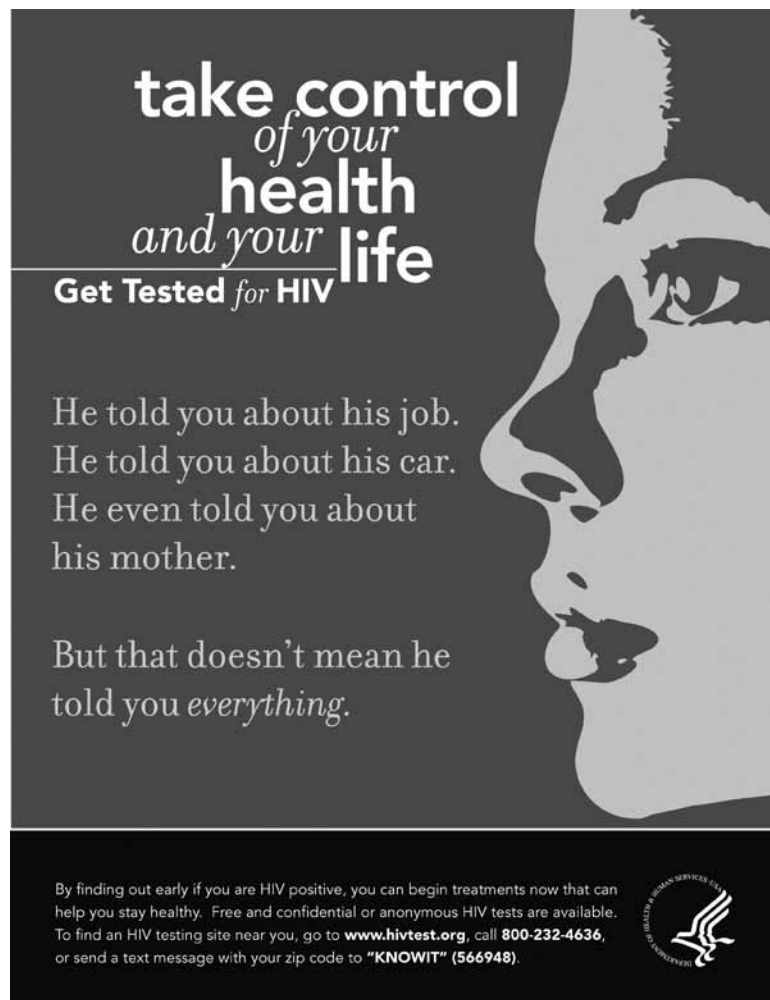
job opportunities, the program covers the soft and technical skills needed for employment in the clinical research and pharmaceutical industries. The program is intended to expand research capacity and quality in the region, and it is also contributing to economic development.

The potential exists to leverage the commercial clinical trials infrastructure in even more-creative ways. In this regard, studies of drugs and vaccines for prevention of anthrax, plague, and smallpox, as well as for other biodefense applications, have been conducted to support public health objectives. In addition, many studies of antiviral agents and vaccines to prevent influenza, including sev-

eral of the H1N1 strain involved in the influenza pandemic of 2009, have been conducted. These studies have been executed on behalf of biopharmaceutical companies and government agencies. The changing landscape of the biopharmaceutical industry and the delivery of health care pose unique challenges and opportunities. Given the moral and economic imperatives to address global public health problems, collaborative efforts between governments, nongovernmental organizations, universities, commercial organizations, and local investigators and communities will undoubtedly provide the most-compelling solutions in the developing world and North Carolina. NCMJ

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# Adapting the Evidence-Based Women's CoOp Intervention to Prevent Human Immunodeficiency Virus Infection in North Carolina and International Settings

Wendee M. Wechsberg, Felicia A. Browne, Rachel Middlesteadt Ellerson, William A. Zule

**T**he intersection of substance abuse, poverty, low education level, unemployment, and homelessness contributes to health disparities and disease among minority women [1, 2]. In North Carolina, for example, African American women are disproportionately affected by human immunodeficiency virus (HIV) infection, compared with women of other races and ethnicities [3]. Building on a long history of research with out-of-treatment substance abusers at risk for HIV infection and the need for gender-focused research, the National Institute on Drug Abuse (NIDA) funded a project in 1998 that tested a woman-focused, culturally specific intervention for African American women who lived in the areas of Raleigh and Durham, North Carolina, and were using crack cocaine. The Centers for Disease Control and Prevention (CDC) evaluated this intervention, known as the Women's CoOp [4], and determined it to be a "best-evidence" HIV behavioral prevention intervention [5]. The Women's CoOp has been underway in North Carolina for more than 10 years, with follow-up of participants up to 7 years after enrollment [6].

The Women's CoOp is based on empowerment and feminist theory and encourages women to understand the risks of substance abuse and how abuse can affect personal power and leave women vulnerable to risky sexual behavior and victimization [7]. The framework of the Women's CoOp intervention includes facts about risks associated with substance abuse and the intersecting risky behaviors women face because they lack equality in most relationships. Core elements involve (1) role-play and rehearsal, to teach and practice condom use and how to negotiate condom use with sex partners, with the goal of reducing the frequency of risky sexual behavior; (2) active referrals to local service organizations, for women with needs that require extensive counseling and services; (3) a personalized risk-reduction plan,

to help set goals to reduce the frequency of substance abuse and risky sexual behavior, as well as other identified problems (eg, homelessness, unemployment, and victimization); (4) trained interventionists, who deliver the intervention via personalized, woman-focused cue cards that address women's risks in relation to substance abuse, sexual behavior, and violence; (5) access to HIV testing, via the program and/or referrals to local service agencies; (6) distribution of male and female condoms, lubricants, and other risk-reduction materials; and (7) for international settings, translations in local languages, to reinforce intervention content. The skill-building exercises in the woman-focused intervention help build participants' confidence in and mastery of risk-reduction strategies [8].

After the successful outcomes among Women's CoOp participants in North Carolina, the National Institutes of Health provided funding to determine the adaptability of this intervention to other North Carolina populations and in international settings. Subsequently, several domestic adaptations and a larger portfolio of international adaptations have been implemented to reach vulnerable women, such as sex workers, injecting-drug users, and female substance abusers who are at-risk for infection because of social status, race/ethnicity, and gender inequality in settings with a high prevalence of HIV infection.

The first adaptation in North Carolina, which was funded by NIDA in 2005, targeted pregnant African American women receiving substance abuse treatment. Responses from focus groups conducted during the formative research phase of this study indicated that pregnant women had risk factors for HIV infection, including continued substance abuse and unprotected sex, that were similar to those found in the other studies. However, women also reported that, during pregnancy, they experienced violence at a greater

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frequency than when they were not pregnant. Some of the women in the groups were living with HIV and had children who had different HIV birth outcomes. All of the women living with HIV shared the importance of their social networks, housing, and community support in their daily needs.

This adaptation used an important innovation that involved filming women while they talked about their risks and struggles during pregnancy, including substance abuse, violence, and the lack of accessible HIV-associated resources and substance abuse treatment. These powerful vignettes were inserted into the intervention for pregnant women to reinforce the information presented, making the vignettes a salient aspect of the adapted woman-focused intervention.

In 2007, the CDC supported a study to adapt the Women's CoOp for use in the Raleigh-Durham area, to help substance-using adolescent African American females who dropped out of school and were sexually active. This adaptation incorporated the advice of the Women's CoOp teen advisory board, the CoOp's long-standing community advisory board, and other experts by addressing more developmental issues, filming young women while they talked about their struggles, and using more-colorful visuals for a more upbeat presentation of the intervention material.

### **Adapting the Women's CoOp for Use in Diverse Cultural Settings**

South Africa has become the focus of a growing HIV/AIDS epidemic and currently has the largest number of people in the world who are living with HIV [9]. Additionally, Black women are disproportionately infected with HIV, and the primary mode of transmission is heterosexual transmission [10].

The first of the Women's CoOp adaptations was implemented in South Africa in 2001, when attention focused on the high prevalence of HIV among pregnant women attending antenatal (ie, prenatal) clinics and on the estimated large number of babies that were acquiring HIV via mother-to-child transmission [11]. An overarching challenge was to appropriately adapt the Women's CoOp for a different population in a different cultural context.

One of the first steps for adapting the intervention involved fostering an open collaboration by generating participant and community involvement. These activities included in-depth interviews with substance-using women who were most likely sex workers, with local service providers, and with local researchers, as well as conducting focus groups involving sex workers. In addition, a community advisory board comprising key stakeholders, such as service providers and South African researchers, was established to help ensure the project's success.

Furthermore, the study protocol was approved by relevant government agencies and institutional review boards in the United States and South Africa, which assured stakeholders that the study satisfied appropriate ethical criteria, includ-

ing safety, and that the US research team had a long-term commitment to the well-being of the study participants. This element was an important part of the study because South Africans have, in the past, been exploited for data collection purposes, yet have not received adequate programs and resources to address the pressing public health problems identified during data collection. For example, although public health officials identified that HIV/AIDS was becoming epidemic among certain South African communities, the subsequent availability of antiretroviral treatment was, for a long period, very limited or nonexistent.

This initial project not only established important cross-cultural collaborations, it also represented the first risk-reduction intervention associated with HIV infection and substance abuse to simultaneously address the intersecting issues of substance abuse, risky sexual behavior, and gender victimization among vulnerable women. The success of the first South African adaptation of the Women's CoOp intervention and a small pilot randomized controlled trial [12, 13] subsequently led to a portfolio of larger studies. Table 1 presents the adaptations in South Africa, along with concurrent adaptations in North Carolina and Russia.

### **Research Strategies**

The Women's CoOp adaptations use formative research methods to clarify how culture and gender affect the risky behavior of program participants. Topics, including substance abuse, risky sexual behavior, sexual partnerships, and gender-based violence, are addressed during in-depth interviews and by focus groups. Questions are also asked about the concerns and unmet needs of women. For example, in South Africa, high rates of untreated sexually transmitted infections (STIs) and HIV infection, high levels of unreported rape of women, and the lack of public health resources available to women were revealed. These findings informed the intervention and the need to develop linkages to nonstigmatizing services. In addition, the community advisory board became an asset in networking with professionals who provide services for women experiencing STIs, HIV infection, and sexual violence. Violence prevention sessions and instruments to measure outcomes were also developed. Of importance, the South African studies informed efforts in North Carolina, as violence and victimization were unaddressed issues in the original Women's CoOp study.

The Women's CoOp studies use a variety of strategies to keep women engaged and to maintain an acceptable follow-up rate. For example, staff offer needed transportation to the field site and, during the follow-up visit, share child care responsibilities. In addition, the program offers hot meals and baths, if needed, and provides donated clothes, toiletries, and food from food banks. During follow-up visits for data collection, grocery vouchers (which are approved for use by the institutional review boards) and bags of essential food items are offered as compensation for participants' time.



**Table 1.**  
**Adaptations of the Evidence-Based Women's CoOp Human Immunodeficiency Virus (HIV) Prevention Intervention**

<b>Adapted study</b>	<b>Location</b>	<b>Sample</b>	<b>Evidence source</b>	<b>Adaptation(s)</b>	<b>Lessons learned/outcomes</b>
Sunnyside Pilot	Pretoria, South Africa	Black sex workers	In-depth interviews, focus groups, CAB, phase I RCT	Violent men, dry sex risks, rape issues, violence prevention	Various categories of other sex partners (ie, roll-ons/casual, clients, main partners) were associated with different levels of risk and violence. Decreased frequencies of unprotected sex and substance use were observed.
Pretoria Women's Health CoOp	Pretoria, South Africa	Black sex workers and women having unprotected sex	CAB, phase III RCT, in-depth interviews	Translated all materials into Sotho and Zulu	Increased HIV knowledge, communication about condoms and condom use with main partners, and a decreased frequency of gender-based victimization were observed
Cape Town Women's Health CoOp	Cape Town, South Africa	Black and Coloured women	Focus groups, CAB, phase I RCT	Individual to group format	Use of alcohol and illicit drugs (confirmed by biological tests) and risky sexual behavior decreased in the group and among individuals 1 month after intervention implementation.
Pregnant Women's CoOp	North Carolina	African American pregnant women in substance abuse treatment	Focus groups, CAB, experts, phase I RCT	Prenatal issues and risk factors, ART, vignettes of recovery	Satisfaction with the adaptation and feasibility study, with reductions in homelessness, substance use, and violence, and an increase in HIV knowledge. Filmed vignettes of women's most memorable stories. The outcome was a reduction in the frequency of risky sexual behavior.
Russian Women's CoOp	St. Petersburg, Russia	Women injecting drugs who are in substance abuse treatment	In-depth interviews, phase I RCT	Alcohol and other drug risks in Russia, translations, nutrition intervention	Examination 90 d after detoxification revealed decreased frequencies of risky sexual behavior and injecting-drug use. High levels of HIV infection and injecting drug-associated risk factors remain. The study identified the need for gender-focused treatment and interventions to prevent HIV infection.
Western Cape Women's Health CoOp	Cape Town, South Africa	Black and Coloured women aged 18-33 y	Expert panel, CAB, phase III RCT	New nutrition attention intervention, refinement of pilot women's intervention	The study is ongoing, although differences between the study communities are being found with regard to alcohol and other drug use. There are higher levels of HIV infection among Black women, and higher levels of methamphetamine use among Coloured women.
Young Women's CoOp Study	North Carolina	At-risk African American women aged 16-19 y	Expert panel, CAB and TAB, focus groups and in-depth interviews, pretesting and pilot testing, RCT	Developmental issues, teen pregnancy, problem solving, values, gang issues, dinner club, brighter colors, more visuals	The RCT phase was initiated in May 2010. Many barriers were found in recruiting these teens. The majority have had babies. Recruitment is ongoing.

Note. The term "Black" conveys meanings unique to South Africa. During Apartheid, the South African government defined the population in terms of 4 racial categories under the law: Black, White, Coloured, and Indian. Persons of mixed ancestry were considered to be Coloured, whereas those of Bantu ancestry were considered to be Black. ART, antiretroviral therapy; CAB, community advisory board; RCT, randomized controlled trial; TAB, teen advisory board.

All of the pilot and larger studies used randomized designs in the community, with follow-up interviews conducted 3-12 months after enrollment. In each study, effect sizes for improvements in the main outcomes (ie, substance abuse, risky sexual behavior, and victimization) between baseline and follow-up in the woman-focused intervention ranged from small (ie, 0.2) to large (ie,  $\geq 0.8$ ), using Cohen's classification of effect sizes [14].

## Lessons Learned

One important aspect of these cross-cultural projects is that, as the projects progressed, the lessons learned from one project enhanced a subsequent project by improving the intervention. These improvements helped fashion interventions that have the potential to benefit communities and provide sustainable effects. For example, successful community-based research must reflect community norms and engage communities at large "where they are at" on multiple levels to effect change. This is similar to engaging with patients in a clinical setting, where practitioners must engage individuals "where they are at" and then help them change what might be considered risky behavior.

Another example is the evolution of our comparison conditions. The original Women's CoOp study used a 3-group design that included a delayed treatment control group and a relatively powerful comparison intervention (ie, the NIDA standard intervention). However, 3-group designs are prohibitively expensive, whereas delayed treatment control conditions do not provide equivalent contact time. Therefore, an attention-control intervention was developed for use in Russia, where a nutrition intervention based on the potato—a Russian food staple—was adapted. This interven-

tion component subsequently informed the development of a community meal plan in South Africa that was based on healthy uses of the potato. Potatoes are a popular food (when fried as "chips") in South African township communities where the Women's CoOp operates. Consequently, as part of the intervention, there were demonstrations of ways in which a potato can be prepared with other fresh items from the corner vegetable stand to increase its nutritional value.

Moreover, there are few options for physical exercise in South African township communities. However, realistic options for women were explored, such as a women's netball team and walking clubs, and the most viable were included in the intervention to improve women's health and well-being. Also, when the Women's CoOp began its formative work with teens in the North Carolina study, the nutrition and wellness intervention was expanded to include issues associated with obesity and stress management. These refinements in the comparison condition have increased scientific rigor and provided substantial benefits (ie, improvements in general health) to women who are assigned to the comparison conditions.

## Key Innovative Characteristics

Table 2 describes the key characteristics found across all the Women's CoOp studies. However, some important innovations to note include using computer-assisted self-interviewing and audio computer-assisted self-interviewing, inserting video vignettes of women telling their stories into the intervention, conducting the community interventions by using community peer leaders as the interventionists, conducting rapid biological testing (for pregnancy, sub-

**Table 2.**  
**Key Characteristics Across All Women's CoOp Studies**

<b>Characteristic</b>	<b>Method(s) of operationalization</b>
Education	Educate women about HIV/AIDS, STIs, substance abuse, and violence prevention within their cultural context (eg, by race/ethnicity and geography) to personalize risk
Formative assessment	Conduct formative assessment, using focus groups and/or interviews and meetings of the CAB and expert panel, to address specific issues of the target population
Focus on at-risk women	Focus on women who are at risk for HIV because of risky sexual behavior, substance abuse, and/or violent victimization
Community-based sites	Establish community-based sites that are easily accessible and comfortable for the target population
Interventionists	Hire and train women from target-population communities to deliver the intervention
Training	Conduct intensive training with hired staff, and supplement training with an intervention manual
Intervention sessions	Provide 2 or more brief individual and/or group intervention sessions
Community support	Establish community support for the intervention from established CAB members, community members, organizations, and service providers
Quality assurance	Implement and maintain quality assurance procedures

Note. AIDS, acquired immunodeficiency syndrome; CAB, community advisory board; HIV, human immunodeficiency virus; STI, sexually transmitted infection.

stance use, and HIV), and assisting with immediate referrals to sites by using a comprehensive referral guide that is updated regularly (this activity is essential, irrespective of the setting).

## Next Steps

Currently, the principal investigator of these studies is helping with the adaptation of the Women's CoOp intervention for use among college students at a historically Black university. We are also determining an appropriate adaptation for Latinas with service providers. The principal investigator is also testing a training package of the South African adaptation of this intervention, which has been included in the US Agency for International Development compendium of selected HIV programs in sub-Saharan Africa that integrate multiple gender strategies [15]. This package will expand implementation of the Women's CoOp intervention

to a variety of settings across South Africa and other sub-Saharan African nations.

Additionally, over the past few years, we have learned that to have a greater impact we also need to focus on men and issues of gender-based violence. Accordingly, our current work in Africa includes not only a women's intervention, but also an adapted intervention for men and couples, which addresses the interacting dynamic of couples, concurrent partnerships and risky sexual behavior, and how substance abuse affects risk and gender-based violence. NCMJ

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# Latino Health Coalition: Professional Development for Lasting Change

*Stephanie Carter Caplan, Melissa Edwards Smith*

Imagine that you are a clinician traveling by bus in the early morning for more than an hour on winding, dusty roads to visit a newly opened Mexican hospital. When you arrive at the one-story facility, you take in the scenery. There is a beautiful view of the surrounding fog-rimmed mountains and a well-worn soccer field across the street. As you make your way to the front door, you notice something that seems so familiar yet so out of place. In front of this remote hospital in the heart of central Mexico, there are 2 vehicles in the parking lot with North Carolina license tags. You realize the patients in this facility could also be your patients in North Carolina.

Experiences like this have been shared by the 99 North Carolina health care professionals who have participated in the Latino Health Coalition, a program established by the University of North Carolina (UNC) Center for International Understanding (CIU) in 2003. This yearlong study program offers a unique response to one of North Carolina's critical health issues—serving the health needs of Mexican immigrants. The Latino Health Coalition helps North Carolina physicians, nurses, public health workers, and health administrators gain a better understanding of their Latino patients, bridging cultural differences to improve services. It joins other CIU-sponsored programs that, since 1979, have taken more than 8,000 North Carolinians abroad to 48 different countries to promote global competence and awareness among North Carolina's current and future leaders.

The program has 3 parts. First, teams are formed among local health care professionals, administrators, and outreach workers. They assess Latino health challenges in their communities to identify issues on which to focus. Second, the teams travel to Mexico for a short-term immersion program, visiting some of the same communities that send family members to North Carolina for work. Teams see components of the Mexican health care system, including hospitals, clinics, and traditional healers, firsthand and interact with Mexican families. Third, informed by their experiences in Mexico, the teams return to North Carolina to implement local action plans.

Tom Bacon, director of the North Carolina Area Health Education Centers (AHEC) program and executive associate dean in the UNC School of Medicine, took part in the Latino Health Coalition and has supported the participation

of several AHEC-affiliated professionals. Bacon and other alumni believe the program's strengths include the chance to experience Mexico firsthand, the opportunity to build networks with other North Carolina health professionals, and the opportunity to collaborate on long-term action plans to address Latinos' access to care.

## What Makes the Latino Health Coalition Unique?

The majority of North Carolina's Latino immigrant population originates in Mexico, according to US Census data [1]. However, most North Carolinians are unfamiliar with the parts of Mexico that these immigrants call "home." With the help of universities and nonprofit partners in Mexico, the Latino Health Coalition takes study participants to the heart of Mexico for a weeklong immersion training program that combines experiential learning, stakeholder involvement, and participant accountability to increase participants' cultural and professional competency and, ultimately, improve health care for Latinos living in North Carolina.

Immersion training differs from classroom- and online-based training in an important way. International immersion training is conducted by means of experiential teaching strategy in which learners are surrounded by a foreign culture as part of their learning environment. This firsthand experience, which includes access to a range of health professionals, sets the Latino Health Coalition apart from other professional development opportunities. Many aspects of culture are so ingrained that it is difficult to grasp the significance of family, history, food, religion, and language until these concepts are stimulating all 5 senses at once.

The CIU creates a supportive learning environment that challenges participants to see another side of Mexico. The study program balances urban and rural interactions with site visits to hospitals, clinics, and university training facilities and includes conversations with village herbalists and families who have relatives living in the United States. The week culminates with opportunities for informal conversations and for interaction with a Mexican family. Overall, the cultural immersion experience teaches program participants how health care in Mexico fits into the country's larger cultural and societal context.

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Participating teams generally consist of 3-6 members representing a range of health care occupations, from top-level administrators to direct-service providers. The average size of a coalition delegation is 25 members. Before travel, teams follow a guided process that engages a larger network of community agencies and Latino residents to determine the unique challenges and resources that exist in the community of interest. Informed by a comprehensive look at the local community, teams identify a particular health issue, such as childhood diabetes, that they would like to investigate while they are in Mexico.

On returning to the United States, teams are charged with connecting learning experiences to the needs of their local Latino community. Each team collaborates with its local network to develop and implement an action plan that details goals, strategies, and measurements of success. The CIU re-engages the teams during the following year to share best practices and track success.

### Personal and Professional Influences on Health Care Professionals

Participants reported increased professional and cultural competencies during evaluations conducted before and after the experience. In addition, in 2008, the CIU and the University of North Carolina-Greensboro SERVE Center for Continuous Improvement collected data to capture personal and professional outcomes from former participants. The data showed that 50% of responding health care workers made changes in their professional areas in 3 or more ways [SERVE Center, unpublished report]. The benefits most frequently reported by health care professionals include the opportunities to undergo cultural training, to engage in increased community dialogue about Latino or immigration issues, to improve their effectiveness with Latino patients or clients, and to change policies and procedures in their workplaces.

Some common themes emerged from the survey responses. The SERVE Center study concluded that “participants were willing to be open to what they learned through the initiative, the impact of their involvement made them more aware of the issues their communities were facing, and this awareness gave them a platform from which to act” [SERVE Center, unpublished report].

The Latino Health Coalition makes a difference both personally and professionally for health professionals. Carlos Jorge had never been to Mexico before his participation in the Latino Health Coalition, an experience that continues to inform his work with Latino patients. Originally from Colombia, Jorge is a physician and medical director at Presbyterian Novant Heart and Wellness in Cornelius, North Carolina. In an article in which he reflected on the program’s personal influence, Jorge wrote that the

immersion experience to Michoacán, Mexico, revealed how little I really understood about the patient population I was serving. The sacrifices, hardships, and

challenges that many of the patients we serve here in North Carolina have experienced became more real and tangible.... I realize that although I am an Hispanic physician, my cultural background, community, and economic status are totally different from [those of] the Hispanics of Mexican descent that I serve.... Because of the experience in Mexico and seeing *their reality*, I remind myself daily to remember who I am serving, what their life choices and living conditions have been, [and] what sacrifices they have made, and then [I] determine how I can make a positive difference in their lives to make their future life experiences better” [2].

Other health leaders have reported changes in training and staff education. Bacon confirmed that, as a direct result of involvement with the Latino Health Coalition, several AHEC initiatives have been developed to prepare health professionals to better serve the needs of the state’s Latino population (Tom Bacon, personal communication, April 2010). These include Spanish-language courses, interpreter training, and courses in cultural competence in serving the Latino population, with a special focus on the mental health needs of the population. According to Bacon, “Faculty and staff are able to learn firsthand about some of the specific health issues facing the Latino population, as well as the social, cultural, and economic barriers that prevent them from obtaining the care they need on a timely basis.”

### Impact on Latino Health Care

The action plan of a 5-member Wake County team demonstrates the impact the Latino Health Coalition program can have on Latino health care. Nancy Hagan, director of social outreach for St. Bernadette Catholic Church in Fuquay-Varina, North Carolina, was a member of the 2003 team that focused on increasing Latinos’ access to health care.

Before 2003, immigrant families and migrant workers in Fuquay-Varina were largely going without health care [Nancy Hagan, personal communication, April 2010]. County services were 25 miles away in Raleigh, North Carolina, and no public transportation was available. It was rare to find local Spanish-speaking clinicians, and the Latino community was largely isolated. The question Hagan had to answer was how to address these barriers to access. “We came back [from Mexico] to Wake and said, ‘We need to start where the people are to create a health delivery system that works for them,’” Hagan recalls.

Within a year after the group’s return, a screening clinic for migrant farmworkers opened, and grant funding was in place from the John Rex Endowment to establish a lay health advisors program in Fuquay-Varina. St. Bernadette Catholic Church, a trusted community resource for many Latino residents, became the site of this expanding array of health services. Nonprofit, foundation, and county resources all contributed to the expansion of health services that are

extensions of the Wake County team's participation in the Latino Health Coalition.

In addition to expanded access to services, an unexpected outcome arose from the melding of Western and traditional medicines. Observation of the prevalence of herbal remedies among Latinos spurred the creation of a resource guide of medicinal plants for health professionals. "For our people who come from those traditions, it is crucial to know what they've been using as treatment," Hagan said. "Now, if a patient mentions a plant, we have a reference for what it is, even a chemical breakdown. We would not have known to collaborate on this had we not gone to Mexico." Collaboration is behind Wake's successes. According to Hagan, "We needed each other—the county had the programming and the delivery capacity, and we had the trust in the community, as well as the location."

Another example from the many reports of tangible results in communities across the state is FirstHealth of the Carolinas' innovative Patient Navigators program. Patient Navigators serve as liaisons between their cultural communities and the health care system. Hispanic, Laotian, Hmong, and African American students complete a training program designed to help members of ethnically diverse populations find their way through the local health care system. FirstHealth collaborated with Montgomery Community College to develop the curriculum for this program, in which students learn basic health care skills and patient education strategies, as well as interview techniques and computer skills.

Patient Navigators have been integral to FirstHealth's diabetes screening efforts through its mobile health services in Moore and Montgomery counties in North Carolina. Barbara Bennett, administrative director of Community Health Services, stated that FirstHealth has held 57 events at which 1,800 underserved and uninsured people were screened (personal communication, April 2010). "Patient Navigators have been a great help in encouraging Latinos to seek screening," said Bennett, who participated in the 2007 Latino Health Coalition. Follow-up services and appointments are offered, if necessary. FirstHealth also learned to take services to the community by stationing Patient Navigators in places such as banks on Friday afternoons and

inside the front door at Walmart stores.

The Latino Health Coalition has garnered national interest for its alumni's unique approaches to improving the health of Latino patients. Evaluation responses consistently credit the program for building working networks and increasing cultural competency that results in long-term improved health access for the Latino population.

"Participation in the Latino Health Coalition was a wonderful networking experience, since it brought together health care clinicians, administrators, and policy people from a wide array of organizations, all of whom have a commitment to improving access to care for all North Carolinians," said Bacon. According to Hagan, networking while in Mexico, which included being together 24 hours a day for 7 days and shared bus rides and meals, proved invaluable. "That group experience was crucial. We built a network of productive working relationships that led to an exchange of ideas that facilitated change."

### Challenges for the Latino Health Coalition

The need for culturally competent health care professionals is great, and North Carolina birthrates confirm that Latinos will continue to make up a large part of the state's population. In 2008, 21 of North Carolina's 100 counties had a Latino birth rate of 20%-40% [3].

The biggest challenge facing the Latino Health Coalition is lack of resources to offer the program to more North Carolina health care professionals. Funds from the Z. Smith Reynolds Foundation and other foundations have enabled some individuals to participate in the Latino Health Coalition. For the most part, however, individuals must seek a patchwork of funding from dwindling professional-development resources.

At present, interest in the Latino Health Coalition exceeds available capacity. With current resources, the CIU is able to conduct one Latino Health Coalition program every other year. The program reaches only a fraction of North Carolina's health care professionals who serve Mexican immigrants. North Carolina's health delivery system needs more culturally competent professionals at all levels in order to successfully address health disparities among the Latino population. NCMJ

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# Bringing Together Institutions and Individuals in Kannapolis, North Carolina, for Discoveries That Make the World Healthier

Dave Gessner

As you enter the town of Kannapolis, North Carolina, a billboard reads, "Historians will no longer differ on when the modern scientific age began." This is a bold statement from a historic mill town that, just 7 short years ago, was the site of the largest single-day layoff in North Carolina history. Today, that same site has undergone a phoenix-like transformation and is evolving into a global epicenter of nutrition and health care research. The claim on the billboard becomes understandable once you arrive at the North Carolina Research Campus (NCRC); this is the new home of numerous academic, government, and industry researchers and the David H. Murdock Research Institute (DHMRI). The collective goal of the NCRC is to apply an approach grounded in integrated systems biology to the development of tomorrow's healthier, more nutritional foods; improved lifestyle behavior; and targeted therapeutics.

There have been dramatic scientific advances over the past 50 years. Nevertheless, numerous global challenges continue to face the scientific and human health community, including the declining ability of the pharmaceutical industry to address global health requirements, the growing incidence of obesity and childhood diabetes in the developed world, and shortages of locally produced food in the developing world. Together, these issues have led to the number one health and economic issue facing the world today: hunger and proper nutrition. It is estimated that over 1 billion people were poorly fed in 2009, representing a startling increase from an estimated 870 million individuals who were undernourished in 1970 (Figure 1).

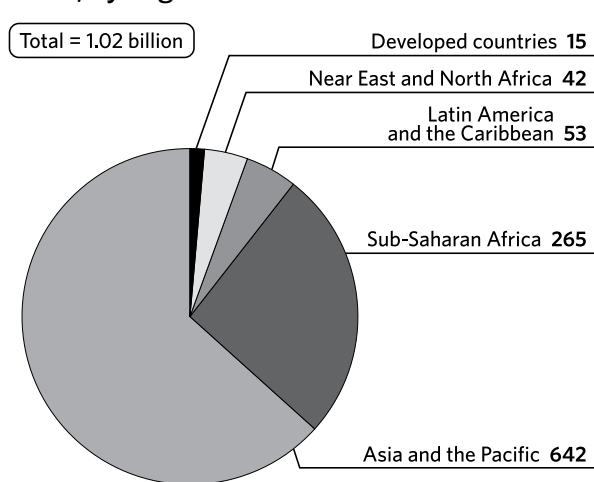
To help reverse this rapid decline in the quality of nutrition worldwide, the biotechnology industry has had a significant impact on crop productivity, but much more remains to be accomplished. Technological advances have helped improve knowledge of the traits needed to improve yields per acre and have increased the nutritional and health value of food crops.

Scientists have been able to use modern research tools to begin the task of identifying bioactive materials in plants that not only have basic nutritional value but also provide therapeutic benefits for the prevention and treatment of human diseases. However, researchers are just beginning to understand how biotechnology can change the way in which

specialty crops can impact human health. While advances in technology and informatics over the last decade have increased knowledge of the relationship between food crops and human health, new tools in understanding the role of proteins and metabolites can now be coupled to genetic data that provide increased understanding and improvement of human health benefits from plant nutrients.

On the drug-development front, the explosion of knowledge generated by the revolution in genetics and biomedical science has not translated as rapidly as initially hoped into breakthrough advances for disease prevention, treatment, and general health improvement. For example, the acceleration of therapeutic discoveries fueled by advances in genetic research over the past decade has been disappointing. The number of novel, first-in-class drug and biologics applications (including those with nutritional and functional-food claims) to the Food and Drug Administration (FDA) has actually declined over the past 10 years, while development costs have soared. Increased costs are driven, in part, by a high failure rate of key studies at the proof-of-concept stage, which bridge preclinical and clinical research. Much of this

**Figure 1.**  
**Worldwide Levels of Undernourishment in 2009, by Region**



Note. Data are millions of people [1].

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is due to the reductionist approaches that were fueled by the ability to mine the human genome for "targets." Knowledge of gene targets without an appreciation of environmental and physiological factors has not led to new therapies. A deeper understanding of human physiology and pathophysiology is needed to decrease these failure rates.

Although the problem is multifaceted, there is a strong consensus that the discovery-to-development gap has grown wider from a lack of emphasis on product-focused translational applications in pivotal areas such as genomics, epigenomics, proteomics, metabolomics, and bioinformatics. This has led to the growing integration of academia, technology, agriculture, and biopharmaceutical industries in an attempt to address some of these challenges. Simultaneously, several national governments have initiated and distributed large "strategic plans," including the National Institutes of Health (NIH) *Roadmap*. Mindful of the impact of these deficiencies, the FDA developed its Critical Path Initiative to stimulate and facilitate a national effort to modernize the scientific process through which potential drugs, biological products (which could include functional foods and supplements), and medical devices are transformed from the discovery or proof-of-concept phase into therapeutic products. As underscored by the FDA, a redesigned and invigorated enterprise of discovery and product development science could generate new methods to investigate the biological mechanisms of disease and more accurately predict the clinical efficacy and safety of emerging therapeutics. However, although applauded by industry and academia, the Critical Path Initiative has not thus far generated sufficient momentum to accelerate progress in translational medicine. This consideration does not just pertain to new drug therapies as traditionally defined, but the same approaches can be applied to an understanding of nutrition and how this can be used to improve human health.

To confront and provide an innovative approach to these ever-increasing global health issues and to provide global leadership to the emerging paradigm shift in the application of a transdisciplinary systems approach, the DHMRI was established as a nonprofit research institute, built from the ground up, to provide superior-quality laboratory services and developmental tools to scientists on the NCRC and to off-campus researchers from academic, government, and industry sectors beyond the boundaries of the NCRC. As the flagship of the NCRC, the \$100 million state-of-the-art DHMRI occupies over 110,000 square feet of space and provides remarkably well-equipped laboratories that bring together a variety of disciplines under one roof. Furthermore, the DHMRI has hired highly qualified scientists to lead investigative efforts. The growing number of research partners on the NCRC include the University of North Carolina (UNC)-Chapel Hill, UNC-Charlotte, Duke University, North Carolina State University, Appalachian State University, North Carolina A&T, North Carolina Central University, UNC-Greensboro, the US Department of Agriculture, Dole

Foods, Monsanto, LabCorp, the Immune Tolerance Institute, and Carl Zeiss Microimaging. Additional partners are under discussion and will be announced soon.

The research strategy of the DHMRI calls for an integrated, transdisciplinary systems approach intent on understanding pathophysiologic characteristics at the target cellular, tissue, and organ levels in plants, animals, and humans to better understand the systemic integration of the environment and genetics. To exploit recent enhancements in technology, the DHMRI has developed an integrated approach in areas critical to driving this transdisciplinary approach, including genomics, proteomics, metabolomics, light microscopy, histochemistry, transgenics, and nuclear magnetic resonance. To anticipate and meet the demands of its research partners, the DHMRI offers a portfolio of stand-alone and combined products and services.

As part of the critical path initiative of the DHMRI and its partners, it is the belief that the identification and use of traits and biomarkers will increase dramatically and change the way in which agriculture, food, pharmaceuticals, and other biotechnology enterprises, including those at academic institutions and private corporations, understand and contribute to human health and development and the economic viability of related projects and products. For example, in drug discovery and development, the use of well-positioned and validated biomarkers has the potential to shorten development times, reduce costs, and decrease failure rates during clinical development and to guide more-informed patient selection for targeted therapies, all of which lie within the scope of the emerging field of companion diagnostics.

Of the many research projects underway at the DHMRI, 2 significant programs that illustrate the transdisciplinary approaches mentioned above are the MURDOCK study (available at: <http://www.murdock-study.com>) and the Center for Critical Path Research in Immunology (CCPRI).

The MURDOCK study, which is under the leadership of the Duke Translational Medicine Institute, is gaining international attention as a leader in next-generation efforts to reclassify disease through the use of so-called omic technologies (eg, genomics and proteomics) and electronic health records. The study is guided by a multitiered approach that includes retrospective analysis, clinical studies, and a long-term longitudinal phase. Its plans and objectives are to understand the mechanisms of disease and, on the basis of these findings, to discover and develop useful biomarkers, diagnostic tests, and therapeutics that guide the next generation of prevention and intervention strategies. In this far-reaching study design, each component stretches toward incremental knowledge that will illuminate the next horizon of inquiry.

Research partners in this study include Cabarrus Health Alliance, Carolinas Medical Center, the North Carolina Biotechnology Center, Rowan Cabarrus Community College, the UNC Nutrition Research Center, and the DHMRI. The



MURDOCK study has an ultimate enrollment goal of 50,000 patients, and with 3,200 patients already enrolled in the first year, it is well on its way to reaching this milestone.

By capitalizing on these assets, the MURDOCK study could catalyze a cycle that will use molecular techniques, generate and test clinical hypotheses, aggregate and disseminate new knowledge for clinical practice and disease prevention, stimulate novel mechanistic theory and discovery, elucidate and test novel prevention or intervention strategies, discover and evaluate new therapies, and promote wellness in a way that will consolidate emerging knowledge, strengthen the global population and the health care system, and unburden economies.

Located within the DHMRI, the CCPRI serves a unique role at the intersection of academia, government, and industry. Through a collaboration between the Immune Tolerance Institute and the University of California at San Francisco, and with funding, in large part, from the NIH, the CCPRI expects to facilitate the development of diagnostic tests and drugs for a wide range of disease conditions, including allergy, asthma, autoimmune diseases, cancer, cardiovascular disease, immunodeficiency, infectious diseases, and immune challenges following organ and tissue transplantation.

The goal of the CCPRI is to provide a one-stop solution for analysis of the immune system's role in disease by integrat-

ing advanced technology platforms in cellular, proteomic, genomic, and bioinformatic analyses. These platforms are deployed to perform multiple cellular and molecular assays on specimens obtained from patients during clinical trials of emerging therapeutics. The mechanistic data that are generated from these assays are analyzed in parallel with clinical safety and efficacy data by using advanced bioinformatics approaches that leverage new insights at the nexus of emerging life-science and information technologies. The correlation of mechanistic and clinical data will identify high-value biomarkers predictive of the course of a disease, the likelihood of response to an individual drug or biologic, as well as drug efficacy and safety. Such biomarkers will serve to more effectively guide drug development and match patients with therapies that provide them the greatest benefit.

There is no argument that the health care issues facing the world are complex and require a new paradigm of discovery, analysis, and deployment. It is recognized that the answer will not come from a single entity, but through a collaborative effort between academia, industry, and government that relies on a transdisciplinary technological approach. The NCRC intends to be a global leader in providing tomorrow's health care solutions by bringing together institutions and individuals for discoveries that will make the world healthier. NCMJ

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# Reports From the Field: North Carolina's Global Health Connections

Rose Hoban

**D**uring the past 2 years, I was privileged to have the opportunity to take a closer look at the global health activities of North Carolinians and institutions based in the state. The result of this reporting, a series called Global Health Connections (available at: <http://rhoban.wordpress.com>), aired on WUNC initially in March 2009 and again in June 2010. One of the most difficult parts of the assignment was choosing to focus on only a handful of the many, many, many global health activities executed by North Carolinians!

The project was funded by a no-strings-attached grant from the University of North Carolina (UNC) Gillings School of Global Public Health. I spent about 6 months in 2008 talking to people involved with global health, getting ideas and hearing about projects. Given my limited time in the field, I wanted to focus on one geographic area rather than spending an inordinate amount of time traveling. As time went by, I found myself hearing a lot about Africa, specifically southern Africa.

As some of the people I spoke with will recall, I wasn't interested in being yet another reporter parachuting into a place and only skimming the surface. These people will also recall that, initially, I wasn't interested being yet another reporter to go to Africa to report on human immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS). Twenty-five years into the epidemic, I felt that there were many issues other than HIV/AIDS that were left untouched, and I really wanted to dig into the problems associated with them. I'm particularly interested in issues of health system organization, strength, and competence; supply and retention of health care workers; and treatment of infectious and chronic diseases *other* than those associated with HIV/AIDS.

However, in Africa, HIV/AIDS is like a lyric from an old song: it's "so high, you can't get over, so low you can't get under it, so wide, you can't get around it..." Because all other issues involving African health systems are so profoundly altered by and subordinate to HIV/AIDS, in all but one of the stories I eventually reported,<sup>a</sup> it inevitably hovered prominently in the background, unless it was the outright focus of the piece.

I eventually chose to go to Malawi, primarily because it was a place that I knew next to nothing about (I did want something of a challenge). I also eventually chose Malawi because it was a place that I kept hearing about from the people I spoke to. The UNC Gillings School of Global Public Health did *not* ask me to travel to their project in the Malawian capitol of Lilongwe. However, I came to recognize later that I probably kept hearing about Malawi because so many people connected to UNC-Chapel Hill have traveled and worked there over the years.

Once I started saying the word "Malawi" to people, other activities came to my attention, including those of Tom and Eve Vitaglione. Tom is known to NCMJ readers as a child health advocate. However, he and his wife met as Peace Corps volunteers in Malawi in the 1960s. More recently, they have become intimately involved with Malawi Children's Village, an orphan project in the southern part of the country. Once I heard about this project, I knew I had to go to see it. All other decisions flowed from that one.

In terms of issues, I was interested in unsafe abortion. I contacted the Chapel Hill-based nongovernmental organization (NGO) Ipas to ask whether they had any activities in southern Africa and learned they were planning a workshop for local reporters in the Zambian capitol Lusaka. The workshop was planned during the same time frame I'd identified for traveling to Malawi. This meant they would have personnel on the ground during my travel period who could help with making contacts. This completed my itinerary.

The array of people and global health activities I found North Carolinians engaging in represent the huge range of opportunities and projects being pursued by people from the state. Consider first the efforts of the Vitagliones, who are working in a true grassroots style. They raise money from friends, family, their church, and others each year for Malawi Children's Village and act as board members and technical consultants remotely from the United States. All of the Vitagliones' activity supports a program conceived of and run by people from Malawi, who fully determine the scope of their own activities.

The Ipas example is more common to many agencies in

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a. The story described the work of a surgery resident at the UNC School of Medicine who was collecting data on traffic injuries and fatalities in Malawi. These data will eventually help local officials create a trauma registry and strategy for injury prevention.

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North Carolina. Ipas is an established, foreign-based, not-for-profit NGO performing advocacy, technical consultation, and program development co-led by ex-patriots and local staff.

The UNC Project-Malawi is an example of a more recent development in global health activity, in which researchers from US and European universities perform large projects that are funded primarily by research money and grants. I found that UNC-Chapel Hill has done an excellent job leveraging their funding in a way that allows them to provide a tremendous amount of service to the local community while accomplishing high-quality research. University projects in developing countries have also provided numerous clinical training and research opportunities for students. Some students continue doing global health work, but many return to the United States, informed by what they saw and did.

I probably could have chosen almost any country to travel to and found North Carolina people and institutions working there—all one need do is pick up a directory to Research Triangle Park, North Carolina, to find many organizations doing great work. For example, North Carolina-based organizations have a presence in Tanzania (eg, the Duke Global Health Institute, Engineering World Health, and North Carolina State University's summer study program), Cambodia (FHI, RTI International, and the Carolina Population Center), and Kenya (eg, Carolina for Kibera), each performing a variety of activities.

For the second year of the grant, I decided to complete the circle by focusing on how global health activities performed in other countries boomerang back to North Carolina. I wanted the challenge of finding global health projects and ideas that influence the way things are done here in the United States.

When Westerners go to a developing country, with their huge amounts of money and personnel, the influence of their activities is undeniable. In exchange, we in the West often receive *ideas*, which are far more ephemeral commodities. It would have been easy to simply talk about more us-to-them projects during the second year, but I wanted to make the

point that knowledge and skill are much more intangible, yet no less valuable, commodities than the personnel and money that often flow one way in global health activities. In addition, I believe that ideas generated in the global health context *are* important and *do* influence the way we do things here.

I eventually found 4 projects. Again, they fit roughly into the categories I'd found in the first round of reporting: grassroots work, technical assistance, and university research. However, because the actors in these stories were trafficking in ideas rather than in money and personnel, these stories presented more-nuanced connections to global health. The first story addressed an HIV prevention research project in Durham, North Carolina, that is patterned on techniques used in cross-cultural research in other countries. American researchers are finding that the sociology of other cultures can inform the process of doing research here. Essentially the project creates the soil for a successful future grassroots project. The second piece reviewed Duke University research about the state of orphans in poor countries, which has ended up influencing how we think about care for kids in the United States. In the third story, I discussed a quality-assurance laboratory for testing the reliability of products used in health projects around the world. Finally, I looked at the grassroots-level efforts of student volunteers who work with technicians in developing countries to repair and maintain medical equipment. After gathering information, the students come home and create products to be used in the technicians' countries. The story focused on several students who started a business to manufacture and distribute their invention. Once again, I came away impressed by the energy and creativity being employed by public health practitioners here in North Carolina and in other countries.

At the end of my reports last year, I reflected on the many clever people and tremendous creativity in places such as Malawi and Zambia. I'll add that a similar degree of cleverness and creativity are present in North Carolina, too. It was a privilege to witness how so many people are finding ways to use their many talents to improve health worldwide. NCMJ

# The North Carolina Contribution to the CAPRISA 004 Study: The Global Health Initiative in Action

*Willard Cates Jr, Angela D. M. Kashuba*

**T**he results of the CAPRISA (Centre for the AIDS Programme of Research in South Africa) 004 study have invigorated the world of human immunodeficiency virus (HIV) infection prevention [1]. This trial is promising step toward giving women a new tool to protect themselves against HIV infection because it is the first in which a topical pre-exposure prophylactic (PrEP) agent (ie, 1% tenofovir gel) showed a statistically significant decrease in the risk of HIV infection. The tenofovir gel yielded a 39% reduction in risk among all users and a 54% reduction among the most frequent users. Encouragingly, tenofovir gel also showed an overall 51% decrease in the risk of new herpes simplex virus type 2 (HSV-2) infections [1].

The premise of PrEP was developed in part from the observations that tenofovir and similar antiretroviral drugs can disrupt the life cycle of HIV in HIV-positive individuals. HIV prevention scientists who conducted various trials of topical and oral PrEP formulations hypothesized that if a drug such as tenofovir was in the blood stream or genital tract on exposure to HIV, the virus might be destroyed before it could infiltrate host cells. Thus, an individual exposed to the virus would be protected from becoming acquiring HIV infection.

The CAPRISA 004 study was conducted during 2007-2010 in the rural village of Vulindlela and in Durban, both of which are in the South African province of KwaZulu-Natal. The study recruited sexually active women who were randomly assigned to 2 study arms; in one, participants received 1% tenofovir gel, and in the other, participants received placebo gel. Tenofovir gel is a clear, colorless, and odorless viscous gel, packaged in single-dose plastic applicators. Women were instructed to use an intermittent, coitally dependent, vaginal dosing strategy, known as BAT-24, which involves insertion of 1 gel up to 12 hours Before sex, insertion of 1 gel as soon as possible within 12 hours After sex, and use of no more than Two doses in 24-hour period. A total of 889 women were enrolled and randomized; 445 were in the tenofovir gel arm, and 444 were in the placebo arm. One indicator of the study's high quality is the low loss to follow-up—nearly 95% of participants completed the study.

After years of disappointing findings from trials of hope-

ful HIV vaccine and PrEP candidates, the scientific, medical, and advocacy community waited eagerly for the results of the CAPRISA 004 study. The results were met with a standing ovation at the Vienna International AIDS Conference in July 2010. The success of topical PrEP in this trial represents new possibilities for abating the HIV epidemic. One of the most important features of PrEP is that it empowers women who often cannot negotiate safe sex practices with their partners to take HIV prevention into their own hands. A woman at risk for HIV infection could insert the gel before and after sex or could take a pill daily (different trials test these different models) without her partner's involvement.

## The Global Health Initiative: In-Country Ownership

The importance of the trial, however, is greater than its results. The study espoused the principles of country ownership and capacity building well before their emphasis in the president's Global Health Initiative [2]. It also demonstrated the value added by North Carolina institutions in facilitating high-quality science in low-resource settings.

The CAPRISA 004 study was led by a South African institution, a global first. The Centre for the AIDS Programme of Research in South Africa at the University of KwaZulu-Natal (Durban) spearheaded the trial. The study was the product of highly talented South African investigators, who designed a methodologically rigorous randomized trial, chose an appropriate antiretroviral product, designed a creative dosing regimen that served the trial participants' situation, analyzed their data in robust fashion, presented their findings to an international audience, and published their results in one of the most influential scientific journals [1].

## The North Carolina/CAPRISA 004 Connection

Two North Carolina institutions, FHI and the University of North Carolina (UNC)-Chapel Hill, were among the US-based partners that collaborated with the CAPRISA 004 study team. These 2 organizations are also active members of the Triangle Global Health Consortium [3]. The CAPRISA team was able to leverage FHI's organizational strengths in

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science facilitation and its long tradition of managing high-quality clinical trials in low-resource settings. Likewise, the Clinical Pharmacology and Analytical Chemistry Core at the UNC-Chapel Hill Center for AIDS Research added the essential biologic data to complete the etiologic puzzle and conclusively demonstrate that 1% topical tenofovir gel prevented HIV infection. The state of North Carolina is proud to have had a role in this landmark undertaking.

FHI contributed to the CAPRISA 004 study in a number of ways. FHI's director of biostatistics worked with the CAPRISA statistical team, helping them develop the analytic plan and assisting in the primary analysis of trial results, and was a coauthor of the article by Abdool Kareem and colleagues [1]. A senior FHI behavioral scientist helped design the innovative intermittent-dosing regimen used in the study. She also designed and oversaw the ancillary case-control study that was performed to assess factors associated with infection. FHI scientists helped assess the endocrinologic characteristics of different contraceptives used to prevent pregnancy during the trial. An FHI clinician served as the medical reviewer. FHI's senior research informatics scientist assessed the data management site before the study was started. Throughout the trial, FHI staff provided monitoring and quality-control assistance to CAPRISA investigators, to ensure adherence to internationally accepted guidelines for Good Clinical Practice. FHI's Protection of Human Subjects Committee reviewed, approved, and monitored the trial. FHI staff also facilitated meetings of the study's data safety and monitoring board, which reviewed the ongoing conduct of the trial. The results dissemination plan was guided by senior FHI communications advisors.

The UNC-Chapel Hill Center for AIDS Research also contributed to the CAPRISA 004 study in multiple ways.

The Clinical Pharmacology and Analytical Chemistry Core worked closely with CAPRISA 004 investigators to develop the clinical protocol for measuring the tenofovir concentration in the genital tract and blood of study volunteers. The Center for AIDS Research also provided tools and techniques that allowed the CAPRISA 004 investigators to obtain samples in a minimally invasive and minimally labor-intensive fashion. The Clinical Pharmacology and Analytical Chemistry Core developed highly sensitive and specific assays to measure levels of tenofovir and its active metabolite tenofovir-diphosphate in specimens of blood, vaginal secretions, and vaginal and cervical tissues collected from study participants. Finally, the Center for AIDS Research provided pharmacokinetic expertise for data analysis and interpretation of the tenofovir concentrations in the context of gel adherence and efficacy against HIV type 1 and HSV-2 infection.

## Conclusion

The results of the CAPRISA 004 study have changed the field of HIV infection prevention. The CAPRISA 004 trial set a high bar for research conducted in any setting, let alone an institution based in a developing country. The trial's promising results provide hope for a new female-controlled prevention tool. If these results are replicated in the National Institutes of Health-funded VOICE (Vaginal and Oral Interventions to Control the Epidemic) trial, women worldwide will have an effective means of protecting themselves against HIV and HSV-2 infection. Two North Carolina organizations, FHI and UNC-Chapel Hill, were partners to the South African investigators leading the CAPRISA 004 study. This is one of many examples of how North Carolina contributes to global health. NCMJ

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take control  
*of your*  
health  
*and your* life  
Get Tested *for* HIV

Be a  
*beacon* of light  
to others. Your  
example can make  
a *difference*.

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2010



2010

## Child Health Report Card

WITH FINANCIAL SUPPORT FROM:

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## Access to Care and Preventive Health

Access to preventive and primary care is critical to assuring the health of our children. Regrettably, the data indicate that the percentage of uninsured children (including those in low-income families) continues to increase, largely because North Carolina has experienced dramatic losses in employer-based coverage. The picture would be even worse were it not for a dramatic increase in children's coverage through public health insurance programs over the past decade. This increase is thanks to investments made by the General Assembly and the hard work of state and local agencies and others who enroll children and ensure that they receive preventive care.

Other investments in prevention and early intervention have been exemplary. The early intervention system for children with special needs has received national acclaim, exposure to lead continues to decline, and serious illnesses such as asthma are being identified earlier and managed more successfully, largely due to the innovative system of care developed through Community Care of North Carolina. Additional improvement is needed in the initiation and duration rates for breastfeeding, which has the potential to reduce both mortality and morbidity in infants. North Carolina's immunization rate among children 19-35 months of age ranks ninth in the nation. However, recent reductions in state funding may make this ranking difficult to attain in the future. Access to dental care, though showing much improvement, is a problem that deserves continued attention.

Grade	Health Indicator	Current Year	Benchmark Year	Percent Change	Trend
<b>Insurance Coverage</b>		<b>2009</b>	<b>2004</b>		
<b>B</b>	Percent of all children (ages 0-18) uninsured*	11.5%	11.4%	0.7%	No Change
	Percent of children below 200% of poverty uninsured*	20.0%	19.3%	3.6%	No Change
	Number of children covered by public health insurance (Medicaid or Health Choice) (in December)	1,020,317	806,044	26.6%	Better
	Percent of Medicaid-enrolled children receiving preventative care*	81.3%	69.7%	16.6%	Better
<b>Breastfeeding</b>		<b>2007</b>	<b>2002</b>		
<b>C</b>	Percent of infants ever breastfed	73.5%	63.2%	16.3%	Better
	Percent of infants breastfed at least six months	35.9%	33.7%	6.5%	Better
<b>Immunization Rates</b>		<b>2009</b>	<b>2004</b>		
<b>B</b>	Percent of children with appropriate immunizations:				
	Ages 19-35 months <sup>1</sup>	78.3%	77.8%	0.6%	No Change
	At school entry*	96.5%	99.6%	-3.1%	No Change
<b>Early Intervention</b>		<b>2009</b>	<b>2004</b>		
<b>A</b>	Number of children (ages 0-3) enrolled in early intervention services to reduce effects of developmental delay, emotional disturbance, and/or chronic illness*	17,606	10,826	62.2%	Better
<b>Environmental Health</b>		<b>2009</b>	<b>2004</b>		
<b>A</b>	Lead: Percent of children (ages 1-2): <sup>2</sup>				
	Screened for elevated blood levels	49.5%	39.1%	26.6%	Better
	Found to have elevated blood lead levels	0.5%	1.3%	-61.5%	Better
	Asthma:				
	Percent of children ever diagnosed (2009, 2005)	15.5%	17.8%	-12.9%	Better
Hospital discharges per 100,000 children (ages 0-14) (2008, 2004)	151.9	180.2	-15.7%	Better	
<b>Dental Health</b>		<b>2009</b>	<b>2004</b>		
<b>C</b>	Percent of children:*				
	With untreated tooth decay (kindergarten)	17.0%	23.0%	-26.1%	Better
	With one or more sealants (grade 5)	44.0%	41.0%	7.3%	Better
	Percent of Medicaid-eligible children enrolled for at least 6 months who use dental services:				
	Ages 1-5	58.0%	42.0%	38.1%	Better
	Ages 6-14	64.0%	51.0%	25.5%	Better
Ages 15-20	48.0%	38.0%	26.3%	Better	

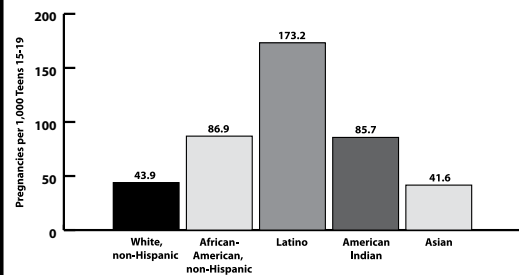
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## Health Risk Behaviors

Children's health behaviors and risk-taking (sexual activity, poor nutrition, physical inactivity, substance abuse, violence, driving habits, etc.) are largely determined by the adults in their lives. Governments, foundations, communities, and schools can provide strong influences as well through the implementation of evidence-based programs and policies that facilitate positive health behaviors.

**North Carolina Teen Pregnancy Rates by Race/Ethnicity, 2004-2008**



Source: State Center for Health Statistics and Office of Minority Health and Health Disparities, North Carolina Department of Health and Human Services. Racial and Ethnic Health Disparities in North Carolina, 2010. Available online at [http://www.schs.state.nc.us/SCHS/pdf/MinRptCard\\_WEB\\_062210.pdf](http://www.schs.state.nc.us/SCHS/pdf/MinRptCard_WEB_062210.pdf).

There have been some successes of note. The national decline in teen pregnancy rates has also been experienced in North Carolina. The continued drop in congenital syphilis and the near elimination of perinatal transmission of HIV/AIDS are true public health success stories. The collaborative efforts of the North Carolina Department of Health and Human Services and the North Carolina Health and Wellness Trust Fund have helped realize a significant decline in youth tobacco use. In fact, for the first time, there have been declines in each of the substances reported below.

While these same agencies—and many others, including the General Assembly—have been collaborating on a Healthy Weight Initiative and other efforts to reduce obesity rates among children for some time, there has been no improvement yet in the relevant indicators. A broad approach to weight management and physical activity that takes into account environmental, economic and social factors is needed to overcome this negative trend and set more children on the path to a healthy adulthood.

Grade	Health Indicator	Current Year	Benchmark Year	Percent Change	Trend
	<b>Teen Pregnancy</b>	<b>2009</b>	<b>2004</b>		
<b>C</b>	Number of pregnancies per 1,000 girls (ages 15-17)	30.1	35.9	-16.2%	Better
	<b>Communicable Diseases</b>	<b>2009</b>	<b>2004</b>		
<b>A</b>	Number of newly-reported cases:				
	Congenital syphilis at birth	9	11	-	-
	Perinatal HIV/AIDS at birth	2	4	-	-
	Tuberculosis (ages 0-19)	24	42	-	-
	<b>Obesity</b>	<b>2009</b>	<b>2005</b>		
<b>F</b>	Percent of low-income children who are obese: <sup>3</sup>				
	Ages 2-4	15.4%	14.9%	3.4%	No Change
	Ages 5-11	25.8%	23.8%	8.4%	Worse
	Ages 12-18	28.0%	27.2%	2.9%	No Change
	<b>Physical Activity</b>	<b>2009</b>	<b>2005</b>		
<b>C</b>	Percent of students (grades 9-12) who were physically active for a total of 60 minutes or more per day on five or more of the past seven days	46.0%	45.9%	0.2%	No change
	Percentage of children (ages 14-17) who watched TV on a typical day for more than 2 hours	25.6%	31.5%	-18.7	Better
	<b>Alcohol, Tobacco, and Substance Abuse</b>	<b>2009</b>	<b>2005</b>		
<b>D</b>	Percent of students (grades 9-12) who used the following in the past 30 days:				
	Cigarettes	16.7%	20.3%	-17.7%	Better
	Smokeless tobacco	8.5%	9.2%	-7.6%	Better
	Marijuana	19.8%	21.4%	-7.5%	Better
	Alcohol (beer)	35.0%	42.3%	-17.3%	Better
	Cocaine (lifetime)	5.5%	7.9%	-30.4%	Better
	Methamphetamines (lifetime)	3.4%	6.5%	-47.7%	Better

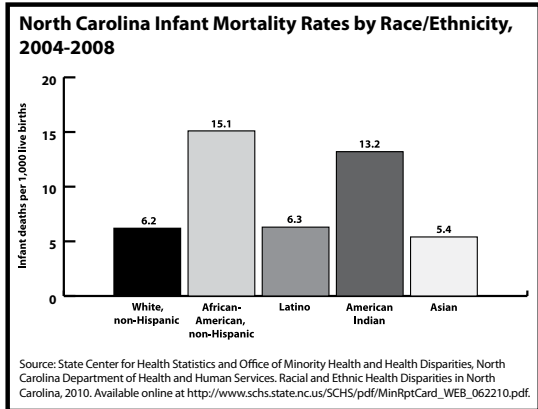
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## Death and Injury

After a few years of stagnation, in 2009 the infant death rate dropped to the lowest level ever recorded in North Carolina. While the rate has declined by more than 25 percent in the past two decades, North Carolina still ranks very poorly among the states. The North Carolina Department of Health and Human Services, the North Carolina Child Fatality Task Force, the March of Dimes and other agencies are providing increased attention to the interconceptional period in hopes of reducing prematurity and low birthweight, which continue to be serious, relatively intractable components of infant mortality. The persistently wide racial disparity in both infant mortality (See Figure) and low birthweight is cause for grave concern, warranting increased attention.

The overall child death rate also dropped to its lowest level in 2009. Injuries remain the leading cause of death in children over age one, but these have been ameliorated and reduced in the past two decades, largely due to the passage of numerous child safety laws, including ATV safety laws and requirements for booster seats and bicycle helmets. The dramatic decline in motor vehicle-related fatalities is attributed in great part to the adoption of the graduated drivers license system for young drivers. The Child Fatality Task Force continues to explore ways to prevent child deaths. The significant decline in homicides as well as the significant rise in suicides will command focused attention.

In an attempt to deal with child abuse and neglect and to provide family support more effectively, all 100 counties now participate in the Multiple Response System, which evaluates and responds to alleged child abuse/neglect. Since the new system has changed many data definitions, trend data on assessments and substantiations are not available. On a positive note, the recurrence of maltreatment, one of the key objectives of the new system, appears to be trending downward. One can only hope that the remarkable decline in child abuse homicides in 2009 will not be a one-year phenomenon, but the beginning of a sharp decline in this most tragic of indicators.



Grade	Health Indicator	Current Year	Benchmark Year	Percent Change	Trend
	<b>Birth Outcomes</b>	<b>2009</b>	<b>2004</b>		
<b>C</b>	Number of infant deaths per 1,000 live births	7.9	8.8	-10.2%	Better
	Percent of infants born weighing less than 5 lbs., 8 ozs. (2,500 grams)	9.1	9.1	0.0%	No change
	<b>Child Fatality</b>	<b>2009</b>	<b>2004</b>		
<b>B</b>	Number of deaths (ages 0-17) per 100,000	67.0	77.7	-13.8%	Better
	Number of deaths (ages 0-17):				
	Motor vehicle related	114	192	-	-
	Drowning	28	13	-	-
	Fire/Burn	8	19	-	-
	Bicycle	1	6	-	-
	Suicide	35	23	-	-
	Homicide	36	51	-	-
	<b>Child Abuse and Neglect</b>	<b>2009</b>	<b>2004</b>		
<b>C</b>	Number of children: <sup>†</sup>				
	Receiving assessments for abuse and neglect	125,665	117,352	-	-
	Substantiated as victims of abuse or neglect <sup>‡</sup>	10,961	N/A	-	-
	Recommended services <sup>‡</sup>	25,590	N/A	-	-
	Recurrence of Maltreatment	5.6%	7.7%	-27.2%	Better
	Confirmed child deaths due to abuse	16	31	-	-

The purpose of the *North Carolina Child Health Report Card* is to heighten awareness—among policymakers, practitioners, the media and the general public—of the health of children and youth across our state. All of the leading child health indicators are summarized in this one easy-to-read document. This is the 16th annual Report Card, and we hope it will once again encourage everyone concerned about young North Carolinians to see the big picture and rededicate their efforts to improving the health and safety of the children whose lives they affect.

Statewide data are presented for the most current year available (usually 2009), with a comparison year (usually 2004) as a benchmark. The specific indicators were chosen not only because they are important, but also because data are available. As data systems expand and provide more comprehensive data, indicators are added to the *North Carolina Child Health Report Card* so that over time the “picture” of child health and safety expands.

Because of space constraints, racial disparity is presented for just two indicators – infant mortality and teen pregnancy. Both show unacceptably wide disparities. Those interested in the disparities across other indicators are invited to visit the web page of Action for Children North Carolina at [www.ncchild.org](http://www.ncchild.org).

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### **“The test of the morality of a society is what it does for its children.” – Dietrich Bonhoeffer**

In retrospect, 2010 and 2011 may be viewed as watershed years in North Carolina’s quest to improve the health and well-being of its children. This is because the data and events of 2009 provide a fulcrum which may tip in the direction of continued improvement or a loss in many of the gains that have been achieved thus far.

The gains have been many. A review of the indicators in this Report Card shows that, though the picture is not always rosy, the health and safety of our children generally improved between 2004 and 2009. Analysis makes it clear that these generally favorable outcomes are not happenstance. They are a reflection of continuing government investments, both fiscal and through enhanced child safety laws; the hard work and perseverance of child advocates and state and government agencies in developing and implementing child health and safety initiatives; and the attentiveness of parents and caregivers. Highlights include:

- More children have public health insurance coverage than ever before, yet the percent of uninsured children in low-income families continues to increase, largely because of the recession and significant declines in employer-based coverage.
- Additional appropriations and service system improvements over past years have brought the infant mortality rate to historic lows, and have expanded access to dental care for low-income families.
- Laws have been enacted to enhance children’s safety, particularly to prevent motor vehicle-related injuries, and the overall child fatality rate has fallen to the lowest rate ever recorded in North Carolina.
- While suicides have increased, homicides—particularly child abuse homicides—have declined significantly.
- For the first time, indicators of teens’ use of alcohol, tobacco and other substances have all declined, some dramatically.
- North Carolina ranked ninth in the nation in 2009 for immunization rates among children ages 19-35 months.

These general gains, however, may be in jeopardy. The full force of the recession was felt in 2009, and 22.5 percent of our 2.2 million children (ages 0-17) sank into poverty, meaning that more children than ever before were (and are) living in significant financial stress. In addition, the percentage of uninsured children increased to 11.5 percent (ages 0-18). Under such conditions, a general decline in children’s health and safety would be expected. These declines are not immediately seen for two reasons: first, it generally takes two to three years for an economic downturn to be reflected in indicators of child well-being; second, even though some budget reductions occurred in 2008, major cuts to children’s services were not made until 2009 and 2010. Due to budget shortfalls, appropriations for many services and supports for children and families were reduced dramatically. Examples include: funds for many infant mortality prevention services were eliminated; support for immunizations was dramatically reduced; and severe limitations were placed on the growth in enrollment in public health insurance for children in low-income working families. It is likely that the effects of these service reductions will be reflected partially in the 2010 data on child health and safety and fully in 2011.

North Carolina faces another funding shortfall in 2011. Thus, as the state considers further budget cuts, North Carolina’s leaders need to understand that, although not reflected here, children’s health and well-being are likely already declining due to past years’ reductions in services and supports. Their challenge will be to set a vision of healthy, safe children within nurturing families, and to do everything possible to attain that vision even in times of budget crises. Nothing less than the future of North Carolina is in the balance.

## Data Sources 2010 CHRC

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### Data Notes 2010 CHRC

1. Immunization is measured for children 19-35 months of age using the 4:3:1:3:3:1 measure. For 2009, the 4:3:1:3:3:1-5 measure is used because it takes into account the Hib vaccine shortage, the required suspension of the booster dose, and the difference between types of Hib vaccines used by the states. More information is available online at <http://www.cdc.gov/vaccines/stats-surv/imz-coverage.htm#nis>.
  2. Elevated blood lead level is defined as 10 micrograms per deciliter or greater.
  3. Obese is defined as a body mass index equal to or greater than the 95th percentile using federal guidelines. The children represented in these data are those who receive services in local health departments or school health centers and are primarily low-income. They may not be representative of the state as a whole.
  4. The number substantiated and recommended services findings are not exclusive, i.e. a child may be counted more than once within those categories and may be counted in both of those categories. This is the case because a child may have more than one report investigated in a state fiscal year. The number substantiated includes those substantiated of abuse, neglect, or abuse and neglect.
- + Data for indicators followed by a + sign are fiscal or school year data ending in the year given. For example, immunization rates at school entry labeled 2009 are for the 2008-2009 school year.

### Grades and Trends

Grades are assigned to bring attention to the current status of each indicator of child health and safety. Grades are assigned by a group of health experts from the sponsoring organizations. "A" indicates that the current status is very good; "B" is satisfactory; "C" is mediocre; "D" is unsatisfactory; "E" is very poor.

Data trends are described as "Better," "Worse," or "No Change". Indicators with trends described as "Better" or "Worse" experienced a change of more than 5% during the period. A percentage change of 5% or less is described as "No Change." Percent change and trends have not been given for population count data involving small numbers of cases. Due to data limitations, only the indicators for alcohol and drug use have been tested for statistical significance. Grades and trends are based on North Carolina's performance year-to-year and what level of child health and safety North Carolina should aspire to, regardless of how we compare nationally.

Tom Vitaglione and Laila Bell from Action for Children North Carolina and Berkeley Yorkery and Lauren Short from the North Carolina Institute of Medicine led the development of this publication, with valuable contributions from many staff members of the North Carolina Department of Health and Human Services.

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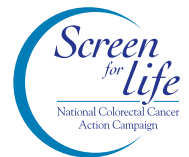
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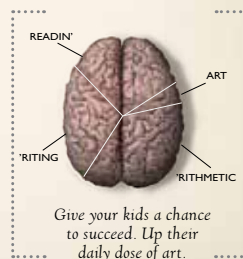
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