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The Future of Global Health Education

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As the Journal of Global Health celebrates its fourth year in circulation, we are proud to continue in leading student dialogue on issues of public health worldwide. However, one issue that often goes unexamined, but which bears great relevance to us as students, is that of global health education. As the expanding workforce of health professionals struggles to tackle global crises such as the current Ebola epidemic, the need for specialized training becomes increasingly apparent. In Volume IV Issue II, *The Journal of Global Health* has chosen to spotlight the emerging field of global health education.

Truly "global" health education is only beginning to gain recognition as demanding a unique set of skills distinct from basic medical training. In order to meet the modern challenges of an increasingly interconnected planet, the medical community must develop new models of global health curricula. Although this process is beginning, we have far to go before a concensus is reached regarding what it means for health education to be "global" and how we can best prepare future generations of health professionals. *The Journal of Global Health* is excited to take part in this process.

As an organization, JGH highlights the voices of students around the world who are actively involved in shaping the future of global health. It has been a tremendous honor to work with the members of JGH and its contributors throughout the course of my undergraduate career. I have been continually impressed by the dedication and initiative demonstrated by our members, and I am excited to present this as my final issue as Editor-in-Chief and as a member of JGH. As I move on, I look forward to seeing JGH continue its tradition of excellence in its contributions to public health discussions.

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Establishing a baseline for water, sanitation and hygiene knowledge, attitudes, and practices in rural Ethiopia

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Although improvements have been made since 1990, access to safe sanitation and improved water in Ethiopia remains low, contributing to the burden of preventable illnesses like diarrhea, trachoma and soil transmitted helminthes. In May 2012, the Ethiopia Outreach student organization, from the University of Texas Health Science Center at San Antonio, conducted a household survey to measure water, sanitation and hygiene (WASH) knowledge, attitudes and practices to better understand the social and structural determinants of health. While 65.4% of households reported having access to safe water and 100% reported having access to a latrine, only 6% of latrines were improved facilities. A knowledge score was created to determine individuals' understanding of sanitation, hygiene and disease transmission. The Knowledge Score is the sum (maximum score= 33) of all the correct responses for each of seven knowledge questions. It was determined that those who kept their latrines sealed, did not keep animals in their homes, had attended a community meeting within the last year and reported cell phone use had significantly higher knowledge scores than those who did not. This data provides a foundation for understanding the contributors to the burden of preventable disease in Aleta Wondo and a starting point for the design of further research and possible interventions.

Background

Globally, over 2 billion people have gained access to improved sources of drinking water (piped water, public taps, boreholes, protected wells and springs and rain water) and almost 2 billion have gained access to improved sanitation facilities (flush toilet, piped or septic system, ventilated improved pit latrine and composting toilets) since 1990. However, in 2014 more than 700 million people continue to use obsolete drinking water sources and 2.5 billion people lack access to improved sanitation. One billion of these also continue to openly defecate. Over half of the global population lacking access to clean water and approximately a quarter without improved sanitation live in Sub-Saharan Africa.[1] In Ethiopia, significant progress has been made to increase access to improved water and sanitation from 1990 to 2012. However, only 52% of the total population, 42% in rural areas, has access to improved water sources and 24% use an improved sanitation facility. Ethiopia ranks 5th on the list of countries with the highest number of people practicing open defecation with34 million).[2]

It is estimated that 2.4 million deaths (4.2% of all deaths) and 6.6% of the global burden of disease (DALYs) could be prevented through improved hygiene and access to safe water and sanitation.[3] The majority of the water, sanitation and hygiene (WASH) disease burden is dominated by diarrheal illness (53% of DALYs). These disproportionately affect children under the age of five, killing more young children each year than HIV/AIDS, tuberculosis and malaria combined.[4] The remainder of the burden is carried by diseases associated with malnutrition and parasites such as schistosomiasis, trachoma, filariasis and intestinal parasites. Poor access to sanitation leads to fecal contamination in the environment, which results in diarrhea and intestinal parasites including helminthes.[5] Giardia and tropical enteropathy, which significantly contributes to chronic malnutrition in children, are also perpetuated by similar means.[6] Additionally, limited access to water and education leads to poor personal and hand hygiene practices, which contribute to the spread of diseases like trachoma,[7] acute respiratory illnesses,[8] skin diseases and diarrhea.

The Ethiopia Outreach program is a partnership between medical students from the University of Texas Health Science Center at San Antonio and Common River, and a non-governmental organization based in Aleta Wondo with a goal "to create balanced, productive and self-sustaining communities for others to witness and replicate".[9] With one government health center managed by a registered nurse without a physician, Common River requested that the Health Science Center and Ethiopia Outreach provide primary care and public health services to the residents of Aleta Wondo. This particular area of Ethiopia struggles with several specific and preventable health problems such as trachoma, diarrhea and other preventable WASH diseases. Based on clinical experiences, it has been noted that infection with intestinal worms, which has been shown to stunt longitudinal growth, limit educational attainment and affect physical strength is also a common cause of diarrhea.[10] Both access to treatment with albendazole (or a similar drug) and knowledge of oral rehydration therapy for diarrhea appear to be limited in this population. To better understand the structural and social determinants of these WASH diseases, the current team completed a cross-sectional study measuring WASH knowledge, attitudes and practices in the Aleta Wondo community.

Methods

Using a cross-sectional study design, heads of household over the age of 18 were randomly selected to participate in a household survey in the Titara region of Aleta Wondo, Ethiopia. The population of Aleta Wondo is estimated at around 20,000, however there is insufficient data regarding the Titara region. The UTHSCSA IRB approved the protocol.

As maps were not available, the interpreters, who were lifetime residents of the region, served as guides. Data was collected over five consecutive days by teams of three students and one interpreter. Homes were randomly selected for participation in the survey. Using the Common River grounds as a center point, each group visited every nth house (based on a randomly assigned number) moving outward along the main village roads. Upon arrival at a home, the interpreter would greet the household members and ask for the head of household and complete consenting procedures. Each group visited as many homes as possible during daylight hours while data was being collected. In the allotted time period, 52 home

visits were conducted.

Three interpreters, all of whom had worked with previous teams, were hired to provide translation services. They received two days of training during which the research team reviewed the survey line by line, by reading each question aloud and describing its specific purpose. The interpreters then repeated the questions in Sidama, the local language, and Amharic, the National Ethiopian language, to ensure proper translation of the survey. Finally, two groups tested the survey in four households to ensure that the questions were culturally appropriate and well understood.

The current survey was an adaptation of a WASH survey that combined direct interview questions with observations developed and initially utilized by Jason Rosenfeld, MPH in Zimbabwe.[11] The WASH survey measures basic demographics including age, level of education, occupation, number of children and community involvement. Questions were asked about water sources and drinking water practices, cleaning practices, latrine use, garbage disposal, rodent problems and sanitation practices. Finally, questions were asked about the survey respondents' preventative health knowledge of water, sanitation and hygiene. Observations included, but were not limited to latrine type, latrine cleanliness, presence of animals inside the home, animal or human feces on the property, standing water, kitchen cleanliness, kitchen ventilation, use of mosquito nets and standing water. The final observation included a member of a household demonstrating his or her normal hand washing practice.

To assess WASH knowledge, a series of seven questions were asked. Each had three to five correct answers (Addendum A). The Knowledge Score is the sum (maximum score= 33) of all the correct responses for each of the seven knowledge questions. The Hygiene Index (HI) is a composite variable of hygiene practices under development and testing by Jason Rosenfeld. Each dimension of the Index is an observable indicator of diarrhea transmission routes. Taken together the Index is meant to serve as a proxy for diarrhea illness transmission in the household.[11] The HI was created using the following subcategories: environment, kitchen hygiene, hand washing, drinking water, and sanitation/defecation (Figure 1).

Data Management

De-identified data was recorded by hand during each interview and separately entered into Excel by two team members. The two spreadsheets were compared using the program Differencia, and all mismatches were corrected by referencing the hard copy data. The database was then uploaded into STATA 11 for cleaning and analysis.

Results

The majority of participants were married (88.5%), female (69.2%) and had a mean age of 38.3 years. Most (71.2%) were literate, had on average six years of education (SD=5 years) and primarily spoke Sidama (76.9%). Mean household size was six, including an average of two male and two female children.

Several questions were asked to determine the level of household involvement in community activities and how people obtain their news and other information. It was found that 88.5% of respondents had collaborated with their community to solve a problem in the last year. An even greater number (92.3%) had attended a community meeting in the same time frame. Lastly, 80.8% of respondents had approached a community leader concerning a problem. The most common sources of news and information sharing were the radio (86.5%), television (57.7%), friends (21%) and cell phone (19.2%).

With regard to water sources and drinking water practices, the majority of households (65.4%) reported that they had access to an improved water source (piped water, protected spring or well and borehole). On average, households collected water three times daily, totaling an average of 2.7 buckets daily. In addition, 90.4% reported that they believed their drinking water requires treatment, but 32.7% admitted that they do nothing to treat their drinking water. Among those who treat their drinking water, the most common method was purifying tablets (38.5%) (Table 1).

Observations of households revealed that only 20% of kitchens were found to be dirty. A kitchen was labeled as "dirty" if food was left out uncovered, dishes were left unclean or animal waste was observed in the kitchen. Most households (56%) had some flies in their kitchen; however, 32% did not have any flies (Table 2).

The Hygiene Index was used to create a score representative of behaviors related to diarrheal disease transmitted via water, sanitation and hygiene. Interesting components of the index included that 51.9% of households had soap available for hand washing, but only 3.9% had a dedicated hand washing facility (Figure 1).

Regarding sanitation practices, each household had access to a latrine, with three households reporting use of a neighbor's facility. An unimproved, homemade pit latrine (a hole in the ground that was not sealed) was observed on 78% of properties, while improved pit latrines (latrine with a structure built around it, with wooden slats over hole) were observed at only 6% of properties. Latrines were noted to be clean (no waste observed outside the pit) in 46% of households, 18% were moderately clean (some waste observed outside of pit) and 8% were not clean at all (foul-smelling, waste observed

Figure 1 Hygiene Index Components. Observations regarding water, sanitation, and hygiene were categorized and assigned a value to produce and index for further analysis. For example, lack of garbage on the property provided one point in the environment category.

Category	Indicator	Point Value
Environment	No, Garbage	1
	No, Animal Feces	1
	No, Standing Water	1
	Yes, Garbage Pit	1
Kitchen Hygiene	Yes, Clean Surfaces	1
	Yes, Clean Dishes	1
	No, Flies	1
	Yes, Food Covered	1
Hand Washing	Yes, Hand Wash Facility	1
	Yes, Use Hand Washing Facility	1
	Yes, Soap	1
Drinking Water	Yes, Water Cover	1
Sanitation/Defecation	No, Open Defecation	1
	Yes, Access to Latrine	1
	Yes, Clean Latrine	0.5
	Yes, Sealed Latrine	0.5
Hygiene Index = Sum Score		Max = 15

Table 1 Improved Water. The frequency of responses to questions related to improved water are displayed above. Percentages of the total are displayed in parenthesis. Standard deviations are displayed to the right of mean values.

Source	Frequency (%)
Pipe in Town	21 (40.4)
Stream	9 (17.3)
Spring	9 (17.3)
Protected Spring	1 (1.9)
Protected Well	3 (5.8)
Hand Pump/Borehole	9 (17.3)
Think Water Needs Treatment?	
Yes	47 (90.4)
No	5 (9.6)
Treatment Method	
Purifying Tablets	20 (38.5)
Nothing	17 (32.7)
Boil	8 (15.4)
Chlorine	7 (13.5)
Travel Time to Source in minutes	
Mean ± σ	11.5 ± 9.6
Min	1
Max	50
Times Collected Daily	
Mean ± σ	3.2 ± 2.1
Min	1
Max	10
Number of Buckets Collected	
Mean ± σ	2.7 ± 1.9
Min	1
Max	12

Table 2 Kitchen Hygiene. N represents the frequency of observations noted in the table. The percentage of the total is represented in parenthesis.

	N=Frequency (%)
Very Clean	18 (36)
Quite Clean	22 (44)
Dirty	10 (20)
None Visible	16 (32.0)
A Few Visible (1-5)	28 (56.0)
Many Flies	6 (12.0)

Table 3 Knowledge Score. The mean number of correct responses, standard deviation, and the range for each individual knowledge question, the composite knowledge score is displayed.

Variable	Mean ± σ	Min	Max
Oral Rehydration Solution	0.23*± 0.51	0	2
When to wash hands	2.44 ± 0.85	1	4
Diarrhea Transmission	2.13 ± 1	0	4
Skin Disease Transmission	1.56 ± 0.96	0	4
Worm Transmission	0.87 ± 0.89	0	3
Ways water becomes contaminated	1.35 ± 0.88	0	4
Safe water sources	1.60 ± 0.57	1	3
Knowledge Score	10.17 ± 3.16	4	19

outside pit). Only 10% of latrines were properly sealed, a measure which protects the environment from fecal contamination.

Table 3 displays the mean scores of the knowledge questions and the mean composite Knowledge Score. The lowest mean number of correct responses in a single category (0.23) asked participants to describe how to make an oral rehydration solution (ORS). On average, respondents were unable to correctly name one of three ingredients and the ORS's correct proportions, but they were aware of the availability of ORS sachets for purchase at the local pharmacy. Of note, knowledge of the transmission of parasitic disease was also limited in households; on average, survey respondents provided less than one correct response (0.87). The highest mean number of correct responses in a single category (2.44) asked participants to name five situations one should wash their hands. The mean composite Knowledge Score was 10.17 of a possible 33.

Table 4 describes associations between the Knowledge Score and various parameters from the survey calculated using a t-test. It was determined that those who kept a sealed latrine had a significantly higher knowledge score (mean difference= 3.05, p=0.04) than those who kept an open latrine. A higher knowledge score was also noted among those who kept their animals outdoors as opposed to indoors (mean difference= 2.55, p=0.02), and among those who had attended a community meeting (mean difference 3.44, p=0.04) versus those who had not. Additionally, the Knowledge Score was higher among those who used a cell phone (mean difference= 2.88, p=0.008) compared with those who did not.

Discussion

The purpose of calculating a Knowledge Score was to evaluate the overall understanding of water, sanitation and hygiene within the community and to provide a composite baseline score. The average score for this sample was ten out of a possible 33 correct responses. However, there is no value to use as a basis for comparison as this was the first time these concepts were measured and calculated in the area. Of the concepts that were measured to calculate the Knowledge Score, several findings warrant further exploration. These results suggest that respondents knew little about making a home-made ORS and preventing intestinal helminthes and parasites. However, most respondents knew appropriate times to wash hands.

Knowledge regarding the preparation of a homemade ORS was the lowest scoring category within the Knowledge Score (average of 0.23 out of three correct responses). This is concerning considering the prevalence of diarrheal illness in the region. These findings appear to be consistent with the results of other studies. Figures from the 2011 DHS survey indicate that 16% (fourth highest amongst all regions in Ethiopia) of children under the age of five in the Southern Nations, Nationalities and Peoples (SNNP) region where Aleta Wondo is located, reported episodes of diarrhea within the two weeks preceding the survey.[12] In this same region, 25% of mothers provided fluids via an ORS packet and 7% provided fluids via homemade ORS, while 45.7% provided no treatment in the SNNP region.[12] The frequency of mothers treating their child's diarrhea with ORS packets increases to 45% in urban areas, while homemade ORS increases to 13%.[13] Aleta Wondo is a rural community with the nearest city approximately two hours away by bus. The difference in frequency of ORS usage between urban and rural communities likely results from the availability of both resources and information. The limited knowledge of homemade ORS in this sample is likely caused by limited access to health information and the government's focus on treatment of diarrhea with premade packets. Future studies should consider exploring how often residents of Aleta Wondo use ORS to treat diarrhea and the sources from which they receive any information about ORS.

Respondents also had limited understanding about the transmission and prevention of intestinal parasites. On average, respondents provided 0.87 correct ways to prevent the transmission of soil-transmitted helminthes out of five possible correct responses. Observations of household sanitation and hygiene practices provide some insight into this community's capacity to prevent helminthic transmission. While most households in our sample had latrines, very few met the WHO/UNICEF definition of 'improved sanitation', which requires the latrine to be constructed with a ventilation pipe and with a concrete slab that separates the feces from the environment. Keeping feces separate from the environment is integral to blocking the transmission not only of diarrhea, but also intestinal helminthes and other parasites as well. One gram of feces can contain around 10^4 protozoan cysts and 10-10^4 helminth eggs, so when feces are not sealed in a latrine these parasites can be easily spread throughout the environment.[14] The disposal of children's feces is equally important since many rural regions do not place particular emphasis on children using latrines.[15] From the DHS data, only 8% of children in the SNNP region use a latrine and 31% of those children's stools are disposed of in the open.[12] The current study did not inquire about the management of children's waste. Although open defecation was not directly observed, use of the unimproved latrines that were observed is no better than practicing open defecation. Improved sanitation is particularly important in preventing the spread of soil-transmitted helminthic infections, which contribute to substantial childhood morbidity from anemia, retarded growth and poor cognitive function.[15]

With regard to knowledge concerning hand-washing practice, respondents provided an average of 2.13/5 correct responses when asked when they should wash their hands to prevent diarrhea. While this was the highest average score, this knowledge did not appear to be reliably translated to improved hand-washing practices. Only two households had dedicated hand-washing facilities and twenty-seven (52%) households offered soap when surveyors requested permission to wash their hands. These observations are concerning considering the role that proper hand washing behaviors have in preventing disease. Hand washing with soap has been shown to reduce bacterial load to near zero,[15] can reduce up to 48% of diarrhea in children and decrease acute respiratory infections by 23%.[16,17]

One possible explanation for this apparent disconnect between hand washing knowledge and practice is distance to a reliable water source. On average, respondents reported walking 11.5 minutes to the nearest water source, while some households reported spending nearly an hour. The WHO has reported that the average time an African household spends collecting water equates to nearly 30 min per container.[18] Households in this sample reported collecting an average of three containers per day, which, extrapolating from the WHO estimates, equates to roughly 1.5 hours/day spent collecting water. The time required to collect water has an impact on household hygiene practices, as households that travel longer distances will typically collect less water. Having less water available forces households to make choices about water usage. In this sample, households collected and used an average of three five-gallon buckets per day (57 liters total). With an average of six people per household, the average water use is approximately 9.5 liters/person/day. The WHO estimates that a minimum of 7.5 liters per person per day is required for drinking, cooking and personal hygiene, although 50 liters/person/day is needed for all purposes including cleaning and laundry.[19] It is clear that respondents are just meeting the minimum daily requirements for water, which might explain why hand-washing facilities were not observed. While economic factors likely prohibit households from using soap for hand washing, it is possible that hand washing is not yet an established social norm that would encourage households to prioritize household water use and available resources towards soap.[20]

Several noteworthy associations emerged between the composite Knowledge Score and observed practices. As previously reported, higher Knowledge Scores were noted in households that sealed their latrines, those that did not keep animals inside their homes, those that attended community meetings and those that reported using cell phones to get their news. These associations are particularly interesting because they can be grouped into two different categories. Community meeting attendance and cell phone use can both be classified as social behaviors, perhaps indicating the value of a social network in the distribution of informa-

Table 4 Knowledge Score. The Knowledge Score mean difference is displayed for categories of interest.

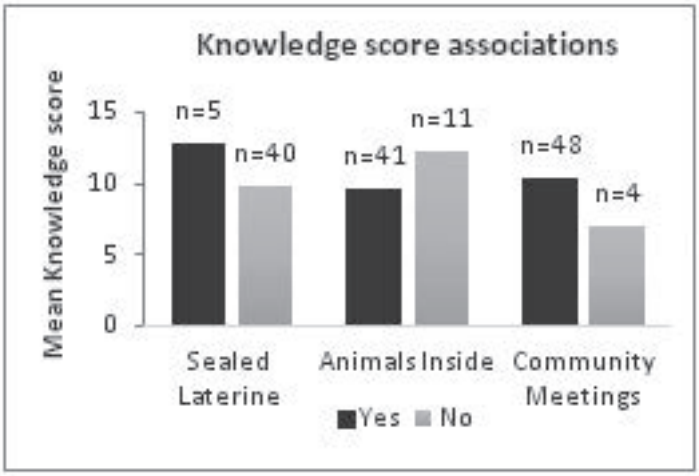
	yes			no			Diff		
	n	Mean	SD	n	Mean	SD	Mean	SE	p
Sealed Latrine	5	12.80	1.30	40	9.75	0.5	3.05	1.44	0.04
Animals Inside	41	9.63	2.67	11	12.18	4.09	2.55	1.02	0.02
Community Meetings	48	10.44	3.05	4	7	3.16	3.44	1.59	0.04
Cell Phone Use	10	12.5	2.86	42	9.62	2.86	2.88	1.04	0.008
Uses Soap	27	9.92	3.77	23	10.21	2.17	0.29	0.89	0.75
Full-time Employment	21	9.76	3.76	31	10.45	2.70	0.68	0.89	0.45
Animal Feces Present	21	10.14	2.43	29	10.14	3.56	0.19	.9008	0.84

tion, which mediate the social norms within a community. Sealed latrines and housing of animals can be categorized as possible surrogates for wealth. While it should be noted that wealth and its impact on WASH knowledge is a multifactorial concept, it is interesting that those who could seal their latrines and those who had shelter for their animals outside of the main compound had higher Knowledge Scores. These associations provide a place to begin further research with the goal of eventually designing an appropriate intervention to help alleviate the burden of preventable disease in Aleta Wondo.

This study had several limitations, most of which can be addressed and modified in future research. First, the sample size of 52 was relatively small. This was a result of limited time in the country, the length of interviews, and a limited number of interpreters. The study's findings were also limited in its generalizability outside of the Titara region of Aleta Wondo surrounding the Common River grounds. Since transportation during data collection was limited to foot, it was not possible to venture outside of this region and return before dark. Future groups may consider splitting groups by region and sending groups by bus. Finally, despite having skilled interpreters, the language barrier was still limiting. This particular issue is very difficult to avoid as it is unlikely that visiting researchers will become proficient enough in Amharic or another local dialect to conduct a thorough interview. If the study continues to use the same interpreters each year, it is reasonable to assume their skills will improve and reduce some of the bias.

The findings of this study indicate the need and potential for an intervention to address WASH knowledge and behaviors in Aleta Wondo. While it is not possible to define the precise details of that intervention with baseline data alone, ideas for the future are certainly not limited. Perhaps a Community Health Club (CHC) that focuses on teaching community members to take ownership of their own sanitation and hygiene would be beneficial. Such endeavors have proven successful in other regions of Africa.[21] CHCs in Zimbabwe focused on creating a "culture of health" in order to change the social norms related to sanitation and hygiene within a particular community.[21] These clubs were found to be a cost-effective, long-term strategy for improving hygiene behaviors.[22] Since a large proportion of the sample in Aleta Wondo had participated in community meetings, it is reasonable to consider this community as a possible fit for a community-based intervention such as CHCs. However, a more detailed needs assessment must be conducted before an intervention can be successful. While improved access to potable water is essential to long-term improvement, altering the social norms with regard to WASH practices in Aleta Wondo is an appropriate starting point to reduce the burden of preventable disease and improve quality of life for residents of the region.

Figure 2 depicts the findings described in Table 7. The mean knowledge score was greater among households that sealed their latrines, those that attended community meetings, and did not keep animals inside their homes.



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Sociodemographic and cultural factors of adult obesity in El Salvador: an exploratory cross-sectional study

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Background/objectives: **The purpose of this study was to explore the sociodemographic and cultural factors associated with adult obesity in El Salvador, a country that has rapidly shifted from food insecurity to obesity as a primary health risk.**

Subjects/methods: **Using face-to-face interviews and a food frequency questionnaire, we interviewed a convenience sample of 180 Salvadorans who identified their dietary habits, perceived nutritional value of food items, and other factors influencing consumption.**

Results: **Obesity (BMI ≥30) was exhibited by 27.3% of participants, and another 41.1% were overweight (BMI 25-30). These results spanned all levels of socioeconomic status. Obesity prevalence, however, was only 18.5% in the most rural area. Obesity increased with age and was almost twice as prevalent in women as in men. Within the occupational subgroup of traditional market vendors, we observed an obesity prevalence of 39.8% as compared with 17.6% prevalence in non-vendors, indicating that in addition to these merchants' relative inactivity, the traditional market has actually become an obesogenic food environment. When asked to describe their dietary decisions, participants overwhelmingly pointed to personal preference and nutritional value as being very influential, while downplaying the effect of cost, convenience, tradition and advertising.**

Conclusions: **With the growing trends of globalization, urbanization, and industrialization, population-based approaches will be necessary to stem the rise in obesity. When setting priorities for such policy measures, precautions must be taken to not exacerbate preexisting health disparities.**

Introduction

Rapid changes in demographics and nutrition in low and middle-income countries are raising urgent public health concerns of obesity-related non-communicable diseases in these countries. [1-5] Due in part to increasingly sedentary lifestyles and changes in food manufacturing and marketing, this phenomenon is seen even in regions that have previously been associated with undernutrition as a primary public health concern. In a systemic analysis of worldwide health surveys, Central America showed one of the greatest percent increases in obesity prevalence of any region of the world from 1980-2008, with the condition affecting over 33% of women in the region.[6] El Salvador, the smallest and most densely populated Central American country, is at an advanced stage in such demographic and nutritional transitions. From 2005 to 2011, the percentage of overweight people in El Salvador jumped from 49% to 63% of the adult population, with 80% of women over the age of 40 overweight.[7, 8] While El Salvador has been very successful in reducing child undernutrition, it is now facing a different public health threat, with an overall obesity prevalence of 26.9%.[9]

While the effects of individuals' physical, economic and sociocultural environment are well understood in relation to under-nutrition, the distribution and determinants of obesity in El Salvador remain unexplored. Health workers and policy makers are not generally informed about the nature of the "double burden of malnutrition," the coexistence of diseases related to undernutrition and overnutrition in the country.[4] The goal of this study is to help rectify this problem by exploring the status of obesity and dietary habits of adults in El Salvador.

Materials and Methods

El Salvador is divided into fourteen sections called departments, which are grouped into four geographic zones—West, Central, Paracentral, and East. One municipality from each of the zones of the country was selected as a representative research site (Table 1), with the criteria of having a population of 1,000-30,000 and being associated with a "traditional market," an open-air mixture of stores and stalls selling traditional and modern foods and goods. Additionally, in response to rapid urbanization, a 1993 legislative decree instituted the Metropolitan Area of San Salvador (AMSS) as a fifth geographic zone, comprised of 27.3% of the total population of the country but only 3% of national territory.[10] Within the AMSS, research was conducted in the Central Market, a traditional open-air market, and Metrocentro, the largest U.S.-style mall in Central America. These sites of commerce ensured access to Salvadorans who were "typical," if not statistically average, and representative of the general population. Sites were also selected based on support from local partner organizations such as health departments and city councils.

El Salvador's National Research Ethics Committee approved the study protocol. Details on the purpose and procedure of the study were given in Spanish on the participant's information sheet and read aloud by the interviewer. All participants gave written informed consent.

The study population was a convenience sample of male and female volunteers aged 18-55 years. Since El Salvadorans generally do not answer phone calls from unknown numbers, rather than using phone surveys, interviewers approached people in person, using a combination of passive (waiting for passers-by) and active (initiating conversation) recruiting to find participants. Exclusion criteria included pregnancy and any overt signs of illness, such as coughing. During July 2013, a total of 180 participants were interviewed at the six sites around El Salvador. Fifteen men and fifteen women were interviewed at each site and had their anthropometric measurements taken (height, weight, and waist circumference), as is typical for such a study. Interviews were conducted primarily in the midst of traditional markets, which are an integral part of the local food system. Due in part to there being more than twice as many 15-24 year-olds in the country as 45-54 year-olds (1,087,107 and 467,856 respectively), the convenience sample included almost twice as many participants in the youngest age group as in the oldest.[8]

Standardized interview data was collected by fifth-year nutrition students from the University of El Salvador. They collected demographic data (Table 2) as well as more detailed information on the participants' dietary habits and beliefs. The latter was collected using multiple choice questions followed by a food frequency questionnaire (FFQ) consisting of the fifty foods most commonly consumed in El Salvador and six non-traditional processed food items. Open-ended questions were also asked so participants could report consumption of food items not included in the list. [11] Participants were asked to rank how often they consumed each food item over the previous year (given eight options ranging from "Almost Never" to "Four or More Servings per Day"), as well as rank each food item's importance for good nutrition ("Not Important, A Little Important, Moderately Important, Very Important"). The FFQ was not considered reliable to estimate absolute nutritional intake and was only used to provide ranking of intake within the study population. [12]

Anthropometric measurements were all taken by a trained clinical technician. All data was collected in the morning for purposes of standardization. Waist circumference was taken with a snug flexible tape pulled horizontally mid-way between the lower rib and the iliac crest (generally two cm above the navel), with two cm subtracted to account for taking the measurement over the clothes (to respect cultural sensitivity).[13] Height was measured to the nearest 0.5 cm with the head, scapula and buttock touching the vertical height-gauge. Participants were asked to remove all outer layers of clothing, including shoes, to ensure accurate measurement. Weight was then taken on a digital scale and corrected by subtracting 1 kg to account for the light clothing worn by participants, as has been done in similar studies.[14] Body Mass Index (BMI) is commonly used as a surrogate for body fat, but its use as a predictor of cardiovascular risk and mortality has been discouraged in recent studies.[15, 16] BMI was calculated as weight in kilograms divided by height in meters squared. Overweight, obesity and severe obesity were defined as BMI ≥25 kg/m^2, ≥30 kg/m^2 and ≥35 kg/m^2, respectively.

Waist-to-height ratio (WHtR), the circumference of waist divided by height, was used as an indicator of body fat distribution. Several studies have shown that WHtR correlates better than BMI with cardiovascular risk factors, coronary heart disease risk and stroke.[16-19] For calculating risk associated with WHtR, general cutoffs of 0.500 for risk increase and 0.582 for substantial risk increase were used.[20, 21] Research is ongoing to validate the clinical significance of these cutoffs.[20]

SPSS version 19 was used for all statistical analyses, primarily percentages and frequencies. P-values were determined in order to demonstrate the difference between these groups. However, as sampling was not random, no generalizations are made and confidence intervals are not used with given prevalence ratios (PR).

Results

Obesity was recorded in 27.3% of participants; another 41.1% were overweight (Table 3). Except in the oldest age group, the prevalence of obesity increased with age and was roughly twice as high in women as in men (PR =1.88, p <0.02) (Figure 1).[1] (P-values were determined in order to demonstrate the difference between these groups; however, since the sample was not random and statistics could not be generalized to a larger population, confidence intervals were not computed). The female average WHtR was 0.570 (Figure 2), which is considered a risk equivalent to a BMI of 30.[20] We found that participants were generally not familiar with BMI, but readily understood when told that a healthy WHtR means that one's waist is under half of one's height. WHtR should be used to discuss weight concerns with Salvadoran patients and could lead to better outcomes than using BMI.[21, 22]

Only 32% of men and 33% of women interviewed said that they eat according to a regular schedule, and 14.4% of men and 10% of women said that they currently followed a special diet (most commonly "low fat" or "low carbohydrate"). Eighty-seven 87% percent of participants noted a difference between rural and urban diets. A majority of those who answered affirmatively went on to specify that they saw the rural diets as superior—, primarily due to a perceived abundance of fresh produce. The remainder said the urban diet is superior for offering greater variety or more protein.

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No strong correlation existed between WHtR and either educational status or type of dwelling. It was possible, however, to draw comparisons between groups from the different geographic areas. In the Central Market of San Salvador (mean age 36 years, with an even spread of participants throughout the 18-55 year age group), 43.3% of those interviewed were obese and another 46.7% overweight. In Metrocentro, San Salvador, whose population includes a high percentage of young students and urban professionals (mean age 31 years), only 13.3% of individuals interviewed were obese. Those living in the Western part of the country had a high prevalence of obesity (38.3%), despite being the youngest group (Table 1). In the most rural site, Arambala, where 86% of the inhabitants come from a rural background, only 18.5% of participants were obese and 36.7% overweight (PR compared with other sites =0.65, p = not significant). In regards to occupation, merchants in traditional markets (n=51) were much more likely to be obese than non-merchants (n=129) (PR =2.26, p <0.003). Severe obesity affected 13% of male merchants and 25% of female merchants.

By analyzing several characteristics, we examined influences on food selection using a Likert scale (Table 4). Some 82% of those interviewed cited preference as very influential in their food choice. 71% answered that their selection is very influenced by nutritional value. 70.6% of respondents were inclined toward price as very influential. Approximately 50% of participants viewed accessibility, speed and tradition as "very influential," however only 12.8% viewed advertisements in the same light. Despite that only 49.4% claimed being

very influenced by tradition, the results of the FFQ showed that tortillas, pupusas, and other types of traditional (especially corn-based) foods are of high daily consumption. Men and women reported similar factors influencing food selection.

Limitations

Despite having local professionals conduct the interviews, the current study was limited by the difficulty in communicating certain concepts with which participants were unfamiliar (e.g., "serving size" of food items). To overcome this, the interviewers used open-ended questions and approximations of certain terms and concepts where appropriate (e.g., using a cupped hand to visually convey "serving size"). Other limitations include the assumptions made surrounding food choice. For example, when describing preference, subjects of similar studies tend to say taste is the primary factor, but research has revealed a complex interaction of social, culture, and environmental/economic influences that subjects might not be aware of.[23] Additionally, a high percentage of respondents indicated that they choose foods based on nutritional value. However, given the recent introduction of myriad novel food items and abundance of cheap sugar and oils, the respondents who gave these data may not have all necessary knowledge about the nutritional value of the foods that they choose. For example, 85.5% of participants consume one to four servings of added sugar per day, and 58.4% said sugar is moderately or very important for good nutrition. Also, overestimation of consumption was likely in regards to food items considered "healthy" such as fruits and vegetables.[24] More sophisticated methods for estimating total consumption should be used in future studies to correlate dietary habits with disease.[25]

Discussion

The above data shows that obesity is an emerging problem in El Salvador, disproportionately affecting women and traditional market vendors. It is possible that the oldest age group was slightly less obese than expected because they grew up in a less obesogenic period of El Salvador's history, as they were born between 1958 and 1967 and entering young adulthood during El Salvador's civil war. The rates may continue to climb as the population ages and more overweight people cross the threshold to obesity.

Trade liberalization (i.e. reducing tariffs and opening markets) has been persuasively implicated as a substantial driver in the increase in obesity and related diseases in the developing world.[26-28] Such liberalization has been ongoing in Central America since the 1980s, culminating with El Salvador's 2006 entrance into the Central America Free Trade Agreement (CAFTA).[29]

Rapid urbanization also plays a key role, as the rural population of El Salvador dwindled from 67% to 37.3% from 1960-2007 and continues to fall.[30] Meanwhile, hundreds of thousands of Salvadorans who were displaced to the United States as refugees during the civil war have since returned home, bringing with them their desire for processed foods.[29] Those who remain in the United States and other countries contribute billions annually in remittances to their relatives in El Salvador (17% of GDP of El Salvador in 2011), much of which goes toward discretionary spending on processed food items.[29, 31, 32] Also, relatives abroad may have greater purchasing power and encourage the preexisting attraction to processed food when visiting their country of origin. In general, global food brands also confer additional status on the user, but the most heavily marketed foods are not the "healthiest".[33, 34] A vast majority of consumers may not realize that advertisements influence their food consumption in some form.[35-38] As people do not want to feel coerced or manipulated, they underestimate the importance of external factors on their daily food choices. To address this, it is necessary to not only target individual behavior, but also shape policies toward encouraging a healthier food environment.

A large enough difference was found between male vs. female to be statistically significant ($p < 0.02$). This was interesting considering that both genders responded similarly about influences of food selection. There are certainly a mix of social, cultural, environmental, and biological factors contributing to this disparity, and it is an interesting contrast to the United States where obesity prevalence in no different between women and men.[39, 40]

The high prevalence of obesity among merchants could be attributable to several factors: First, the people in this occupation remain relatively sedentary, rising only to tend to their clients at the moment of sale (Cecilia M. Suazo, MD, MPH, personal communication, September 4, 2013). Second, these people spend the greater part of their day in an environment in which every kind of food is conveniently available, leading to excess consumption.[41] Third, observational data suggest that many merchants do not eat healthily, despite healthy foods such as fresh fruits and vegetables being among the products they sell.[42] The penetration of processed foods into the traditional diet and an abundance of cheap sugar and oils is a recent phenomenon that warrants further research.

A logical next step is a larger scale study that can report on the prevalence of aforementioned risk factors in El Salvador, especially to uncover a difference between urban and rural populations. Also, research can be conducted on Salvadorans residing abroad to look for changes in risk factors associated with emigration. Additional studies should be conducted in traditional markets to clarify the changes that have contributed to current obesity amongst vendors. A history of undernutrition combined with current overnutrition seems to be triggering the current rise in obesity. Ultimately, a large-scale longitudinal study would best serve to show causation between identified drivers and the increasing prevalence of obesity in El Salvador. In the meantime, nutrition education should be implemented as a low-cost intervention, especially focusing on the risks of processed foods and excess sugar.

Furthermore, with the growing trends of globalization, urbanization and industrialization, population-based approaches will be necessary to stem the rise in obesity. Given this rapidly increasing health burden, it is vital for public health interventions to be formed around the external environmental, economic, and sociocultural factors that drive individual risk. For example, in addition to interventions for health education, other low-and-middle income countries have had success in reducing obesity-related diseases by regulating food manufacturing and marketing, as well as by promoting improved urban design.[43] Still, a majority of the effectiveness research of such interventions is from high-income countries, so when setting priorities for such policy measures in limited-resource settings, precautions must be taken to not exacerbate preexisting health disparities.[44]

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Characteristics of HIV-infected women on antiretroviral therapy who develop preeclampsia in South Africa: a case series

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Hypertensive disorders such as preeclampsia/eclampsia and HIV are important diseases contributing to the incidence of maternal deaths and illness in South Africa. Antiretroviral therapy (ART) is an instrumental medical treatment that specifically targets the HIV virus. ART involves multiple drugs that act on the HIV virus at various points in its biologic life cycle. This treatment during pregnancy has significantly decreased mother-to-child transmission (MTCT) of HIV. Additionally, hypertensive disorders in pregnancy are characterized by increased blood pressure during the gestational period. This spectrum of disorders includes gestational hypertension, mild preeclampsia, severe preeclampsia, superimposed preeclampsia on chronic hypertension, eclampsia and HELLP syndrome, which is characterized by hemolysis, elevated liver enzymes and low platelet count. Among patients who are HIV-positive in South Africa, hypertensive disorders in pregnancy remain one of the most common complications. Therefore, the relationship between hypertensive disorders, HIV, and ART during pregnancy requires further investigation.

As access to ART has increased among women of reproductive age, there is a concern about the safety of these medications in pregnancy. Five cases of HIV-infected patients on ART who developed preeclampsia were identified in a specialized antenatal clinic offering antiretroviral services within the Department of Obstetrics and Gynecology at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH). The maternal and neonatal characteristics and management of labor and delivery in these cases are described. The purpose of this paper is to present a case series of HIV-positive pregnant women on ART who developed preeclampsia and to perform a literature review of the relationship between ART, HIV and preeclampsia. There is a need for early identification and close follow-up of HIV-infected patients on ART who develop preeclampsia to facilitate better obstetric outcomes in these high-risk pregnancies.

Introduction

Hypertensive disorders and HIV infection are important diseases that contribute to maternal deaths and morbidity in South Africa. Hypertensive disorders in pregnancy currently account for up to 19% of maternal deaths in South Africa,[1] while HIV-related complications is the leading cause of maternal death in South Africa.[2] In October 2004, to combat HIV, three-drug combination antiretroviral therapy (ART) became available to all pregnant women in South Africa with a CD4 cell count below 200 cells/mm^3 or with WHO clinical stage 4 disease. CD4 T-cells, the main targets of the HIV virus, are responsible for regulating immune responses, and patients suffering from a WHO Clinical stage 4 disease are defined as HIV-positive individuals with an AIDS-defining illness of stage 4 in the WHO classification system.[4] A CD4 cell count below 200 cells/ mm^3 was the international standard for initiating the three-drug combination ART regimens at the time the chart review was undertaken.[5] The CD4 count and HIV viral load, the level of virus in blood in copies/ml, are used as clinical markers of immune status and disease activity in HIV-positive patients.

Pregnant women comprise one of the largest populations receiving ART in South Africa.[6] ART during pregnancy reduces maternal mortality and morbidity and is the most effective intervention to prevent mother-to-child transmission (MTCT) of HIV. ART decreases viral load in the pregnant patient which thereby decreases the risk of HIV transmission to the fetus with longer duration of therapy during pregnancy emerging as the important factor in determining the effectiveness of preventing MTCT.[6,7]

The effectiveness of ART during pregnancy triggered the expansion of the MTCT program in South Africa to provide ART for all pregnant women with a CD4 count less than 350 cells/mm^3 or WHO clinical stage 3 or 4 disease in April 2010 with further expansions in 2013-2014 to include either a CD4 count of 500 cells/mm^3 or universal access (treating all pregnant and breastfeeding women regardless of CD4 and clinical stage).[8] Policies regarding the initiation of ART are determined by local and national governments with policy guidance from the World Health Organization.

A specialized antenatal clinic offering antiretroviral services was established in July 2004 within the Department of Obstetrics and Gynecology at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH). Within this clinic, ART is rapidly initiated in HIV-infected pregnant women who qualify for treatment, and patients are subsequently closely monitored during the remainder of their pregnancy. After delivery, patients are followed up in a specialized postnatal clinic. Among this cohort of women, hypertensive disorders, such as preeclampsia, are one of the most common complications of pregnancy.[7] With the expansion of ART usage during pregnancy, it has become increasingly important to understand ART's effects, not only in regard to MTCT of HIV, but also in regard to other maternal health issues such as hypertensive disorders in pregnancy. Understanding the relationship between ART and its potential role in hypertensive disorders in pregnancy will allow for optimal obstetric care in this high-risk population.

This report aims to retrospectively examine five cases of preeclampsia among HIV-positive women on ART and to review the current literature on the relationship between preeclampsia, HIV and ART.

Existing literature on preeclampsia, HIV and ART

There is little information on the relationship between HIV, ART and the risk of preeclampsia, with several previous studies yielding inconsistent information on the association of these factors.[9,10] A study from the United Kingdom demonstrated that HIV-infected women who had not received any ART had lower rates of preeclampsia than those on ART.[11] The rates of preeclampsia were similar for HIV-positive and HIV-negative women in their cohort. A study performed in Spain reported that women who were started on ART prior to pregnancy had higher rates of preeclampsia and subsequent fetal death compared to HIV-negative women, but no comparison was made to women who started ART during pregnancy.[12] Similarly, a study performed in Latin America and the Caribbean showed results that HIV-infected women with ART initiation prior to pregnancy had a higher rate of preeclampsia; however, there were no comparison groups in this study.[13]

These results differ from those of a study from Brazil in which women on ART had lower rates of preeclampsia compared to HIV-negative pregnant women.[14] Another study conducted in the U.S. showed no difference in preeclampsia rates between HIV-positive women on ART and HIV-negative women.[15] Another study performed in Canada showed that HIV-positive women on ART did not have a higher risk of preeclampsia compared to HIV-negative women, but they did have risk of having lower birth weight infants.[16] However, these studies did not assess the risk factors for developing preeclampsia in HIV-positive patients and did not evaluate the risk of preeclampsia on HIV-patients who were not undergoing ART. In South Africa, a study performed at Chris Hani Baragwanath Hospital in Soweto showed that HIV infection was not protective against the development of preeclampsia. However, the CD4 cell counts of all the patients enrolled in the study were not recorded, limiting the ability to draw conclusions from the study about the role of disease stage and ART in contributing to preeclampsia.[17]

The above studies fail to show conclusive evidence on the relationship between HIV, ART and the risk of developing preeclampsia. These studies also have several limitations including relatively small sample sizes and the lack of adjustment for confounding variables that could influence outcomes within the patient population studied. As the number of pregnant women on ART in South Africa rises, so does the need to explore the relationship between HIV, ART and complications such as preeclampsia.

Methods

We report a case study of five patients at CMJAH treated from January until December 2009 who developed preeclampsia on ART during pregnancy (Table 1). Forty-eight cases of preeclampsia were identified after reviewing both maternal and birth records at CMJAH. Among these cases of preeclampsia, we were able to identify a subset of six cases of HIV-infected women on ART during pregnancy. One patient was excluded from this case series because the diagnosis of preeclampsia was made at an outside institution. The gravidity (the sum of all pregnancies including terminations less than 6 months), parity (the sum of all births greater than 6 months) denoted as GxPx and Apgar scores (score recorded at 1 and 5 minute intervals post delivery to assess how the baby tolerated the delivery) were recorded.

Hypertensive disorders encompass a spectrum of disorders. The following criteria were used to define the various hypertensive disorders in our case series. Preeclampsia is defined as systolic blood pressure 140 mm Hg or greater or diastolic blood pressure 90 mm or greater after 20 weeks gestation and proteinuria (300 mg or greater over 24 hours, 1+ on urine dipstick or protein-to-creatinine ratio of 0.3 or greater). Severe preeclampsia is defined as systolic blood pressure 160 mm Hg or greater or diastolic blood pressure of 110 mmHg or greater after 20 weeks gestation, proteinuria (5 grams of greater over 24 hours or 3+ on urine dipstick), oliguria, visual disturbances, right upper quadrant or epigastric pain and impaired liver function. HELLP syndrome is defined as preeclampsia with hemolysis, elevated liver enzymes and low platelet count . Superimposed preeclampsia is the development of preeclampsia in a patient with existing hypertension prior to 20 weeks gestation. Eclampsia is defined as the development of seizures in a patient with preeclampsia who has no known seizure history.[3]

At the time of labor and delivery, all patients were managed according to a standard protocol for hypertensive disorders in pregnancy at CMJAH, as defined by the Obstetrics and Gynecology department for managing parturient patients with preeclampsia.[18] The management protocol was as follows: patients with preeclampsia were all admitted for observation prior to delivery; patients were treated with Methyldopa 500 mg orally twice daily and Nifedipine 10mg orally three times daily; magnesium sulfate was given to all patients for seizure prophylaxis. Methyldopa and Nifedipine are the most common medications used for blood pressure control during pregnancy because they do not cause developmental malformations. Blood pressure was recorded every 30 minutes until stable and then recorded hourly. Indications for delivery included pregnancy >38 weeks for patients with mild preeclampsia and pregnancy >32 weeks for patients with severe preeclampsia, eclampsia or HELLP syndrome. Conservative management was recommended for patients with severe preeclampsia who had a gestational age of 26-32 weeks and an approximate expected fetal weight of 900-1500 grams.

All patients were started on a standard first-line ART regimen in pregnancy, which included stavudine, lamivudine and nevirapine. During the time under review, CD4 cell counts were measured at baseline and every six months after treatment initiation. Viral load monitoring was not routinely performed in this population due to financial constraints of the public hospital in this resource-limited setting.

The research was approved by the University of Witwatersrand Human Ethics Committee and exemption was granted by the Institutional Review Board at the University of California, Los Angeles.

Cases

Case 1

A 28-year-old G_4P_3 female presented at gestational week 35 with a blood pressure of 155/94 mmHg. Her past medical history was significant for HIV infection diagnosed during a previous pregnancy in 2008 with a baseline CD4 count of 18 cells/mm^3. She was started on the standard ART regimen at this time and her pregnancy was complicated by gestational hypertension. Her previous pregnancy was a normal vaginal delivery, which resulted in the birth of a live healthy infant. Approximately one year later she returned to the clinic for a subsequent pregnancy with a CD4 count of 275 cells/mm^3. At the gestational age of 37 weeks, she developed a headache and blurry vision and presented to the obstetric ward. At this time she was managed per the standard hospital protocol for hypertensive patients during delivery. She had a vaginal delivery at 37 weeks gestation age, which was complicated by a footling breech presentation of the fetus. There were no other maternal complications and the infant was born alive and healthy. Maternal symptoms resolved after delivery and her blood pressure normalized.

Case 2

A 40-year-old G_7P_4 female presented with preeclampsia superimposed on chronic hypertension at 36 weeks gestational age. Her chronic hypertension was untreated prior to pregnancy. She had a past history of spontaneous abortions. She was diagnosed with HIV in the current pregnancy with a baseline CD4 count of 54 cells/mm^3 and viral load of 1100 copies/ml. She was initiated on the standard ART regimen at gestational week 15. Her blood pressure was well-controlled during pregnancy until 36 weeks, at which time she presented with preeclampsia with a blood pressure of 150/90 mm Hg and was managed per the standard protocol for delivery of hypertensive patients. She ultimately required medical induction of labor for imminent eclampsia at 38.5 weeks gestation. Maternal and neonatal outcomes after delivery were uneventful and her symptoms resolved. She was managed for chronic hypertension.

Case 3

A 24-year-old G_1P_0 female presenting with past medical his-

Table 1 Summary of Cases

Characteristics	Case 1	Case 2	Case 3	Case 4	Case 5
Maternal Age (years)	28	40	24	28	25
Gravidity/Parity[1]	G4P3	G7P3	G1P0	G3P2	G2P1
Gestational Age at time of Pre-eclampsia Diagnosis (weeks)	35	38	37	34	38
Classification of Preeclampsia	Preeclampsia	Superimposed Pre-eclampsia	Eclampsia	Preeclampsia complicated by partial HELLP syndrome[4]	Preeclampsia
Pertinent Medical History	History of Gestational Hypertension in previous pregnancy	History of chronic hypertension	Asthma	History of chronic thrombocytopenia	None
CD4 count closest to delivery (cells/mm^3)	275	54	239	232	112
VL closest to delivery (copies/ml)	NA[2]	1100	3300	NA[2]	680
Gestational Age at ART initiation (weeks)	Previous Pregnancy	15w	32	NA[2]	22
ART Regimen	stavudine, lamivudine, nevirapine	stavudine, lamivudine, nevirapine	stavudine, lamivudine, nevirapine	stavudine, lamivudine, nevirapine	stavudine, lamivudine, nevirapine
Number of weeks prior to delivery on ART (weeks)	68.5	23.5	7.0	NA[2]	16.4
Number of weeks on ART prior to onset of preeclampsia (weeks)	66.5	23.5	5.0	NA[2]	16.4
Mode of Delivery	NVD[3] (complicated by footling breech presentation)	NVD[3] (Induction of Labor)	NVD[3]	Emergency cesarean section for partial HELLP syndrome	Emergency cesarean section for imminent eclampsia + sterilization (bilateral tubal ligation)
Gestational Age at delivery (weeks)	37	38	39	34	38
Birthweight (grams)	NA[2]	3100	2650	1840	2900
Apgars	4/10,7/10	9/10, 10/10	0/10,0/10	6/10, 9/10	6/10, 9/10
Fetal Outcome (at delivery)	Alive/Healthy	Alive Healthy	Intrauterine Fetal Death	Alive/ Healthy	Alive/ Healthy

[1]G, Gravidity- Sum of all pregnancies, including terminations <6 months; P, Parity-Sum of all births > 6 months; [2]NA, not available; [3]NVD, normal vaginal delivery; [4]HELLP, Hemolysis, Elevated Liver Enzymes, Low Platelets.

tory significant for mild asthma was diagnosed with HIV during her current pregnancy and started on the standard ART regimen at 32 weeks gestational age. She presented with preeclampsia at gestational week 37 with a blood pressure of 160/90 mmHg. She developed headaches and seizures at gestational week 39. She received diazepam for treatment of her seizures, but her pregnancy ended in intrauterine fetal demise. She underwent a spontaneous vaginal delivery of the nonviable fetus. Her blood pressure at the time of delivery was 192/106 mmHg. Her CD4 count and viral load near delivery were 239 cells/mm^3 and 3300 copies/ml, respectively. The patient did well after delivery with normalization of blood pressure and no recurrence of seizures.

Case 4

A 28-year-old G_3P_2 female was initially diagnosed with pre-eclampsia at gestational week 34. Her past medical history was significant for HIV infection and chronic thrombocytopenia (low platelet count) of unknown etiology, possibly related to HIV. She had two previous uncomplicated pregnancies with cesarean deliveries. At 34 weeks she developed partial HELLP syndrome (two of three features of HELLP syndrome). She underwent an emergency cesarean section, which was complicated by severe bladder injury. Her CD4 count near delivery was 232 cells/mm^3. Maternal symptoms of HELLP resolved after delivery except for the chronic thrombocytopenia. The neonate had a low birth weight of 1840 grams and was given oxygen at the time of delivery; however, the baby survived without any known complications.

Case 5

A 25-year-old G_2P_1 female with a history of a previous cesarean section for fetal distress was diagnosed with HIV in the current pregnancy. She was started on the standard ART regimen at gestational week 22. Her CD4 count and viral load were not known at baseline but were reported near delivery as 112 cells/mm^3 and 680 copies/ml, respectively. At 38 weeks she presented with a BP of 153/111mmHg and a headache. A diagnosis of preeclampsia was made. She was managed according to the standard preeclampsia protocol but required cesarean section for possible imminent eclampsia and a bilateral tubal ligation. Her pregnancy outcome was successful without any neonatal complications and her blood pressure normalized after delivery.

Discussion

This case series describes five HIV-infected patients who de-

veloped preeclampsia on ART at a public tertiary academic medical center in Johannesburg, South Africa. These cases highlight the importance of exploring the relationship between HIV and ART and its effect on hypertensive disorders during pregnancy. The cases in our study encompass a broad range of hypertensive disorders in pregnancy. Among the hypertensive disorders, there were two cases of preeclampsia, one case of eclampsia, one case of superimposed preeclampsia and one case of preeclampsia complicated by partial HELLP syndrome. The patient with the superimposed preeclampsia had a history of chronic hypertension, which was diagnosed prior to pregnancy. This patient was our only patient in this cohort with a history of a hypertensive disorder prior to pregnancy. There is little information on the effects of ART on pregnancy in patients with known hypertension. Additionally, most of our patients were diagnosed with HIV in the current pregnancy in which they experienced hypertensive disorders. There was one case where the patient was diagnosed in the previous pregnancy and subsequently started on ART during a previous pregnancy at which time she developed gestational hypertension. It is unclear whether the gestational hypertension in her previous pregnancy had a relationship with the initiation of ART and whether this proves to be a risk factor for developing gestational hypertension in future pregnancies.

Hypertensive disorders are associated with preterm delivery, which is defined as delivery at less than 37 weeks gestation. However, in our case series, only one patient had a delivery prior to 37 weeks. Additionally, out of the recorded birth weights, only one was considered low birth weight (less than 2500 grams), which occurred in the patient who had a gestational age of 34 weeks at the time of delivery. Although this patient had low birth weight baby, this neonate had good Apgar scores and remained healthy during the immediate postpartum period. Four out of five of the neonates were alive and healthy at the time of delivery and in the immediate postpartum period. However, one neonate presented as an intrauterine fetal demise (IUFD). In this case, the patient's pregnancy was complicated by eclampsia, which is one of the most severe hypertensive disorders in pregnancy since the patient developed seizures.

There may be a possible relationship between the number of weeks on ART and the development of hypertensive disorders in pregnancy; however, this has not been previously explored. The number of weeks on ART in our population ranged from 5.0-66.5 weeks. The patient with gestational hypertension in the previous pregnancy was started on ART during her previous pregnancy and had the longest duration of treatment in our study, although the duration of treatment before the onset of gestational of hypertension in her previous pregnancy is not known. Given the widespread increased use of ART, the duration of ART and development of hypertensive disorders in pregnancy might be an important area for future research.

Although these cases are variable in outcomes, they highlight the importance of early identification and proper obstetric management of HIV-positive patients who undergo ART during pregnancy and develop hypertensive disorders such as preeclampsia/eclampsia.

Risk Factors for Preeclampsia and a possible role of HIV and ART

The risk factors for developing preeclampsia include first pregnancy, multiple gestation (twins, triplets, etc.), obesity, family history of preeclampsia/eclampsia, preeclampsia in a previous pregnancy, pre-gestational diabetes mellitus, collagen vascular disease (systemic lupus erythematosus), chronic hypertension, chronic renal disease and maternal age less than 20 or greater than 35.[19] Among the risk factors within our population, there was a case of gestational hypertension in a previous pregnancy as well as a case of chronic hypertension. Patients with preeclampsia during pregnancy are at increased risk for developing preeclampsia in a future pregnancy.[19] We are unaware if counseling was provided for early follow-up during recurrent pregnancies in the two patients in our population with hypertensive disorders in a previous pregnancy. Given the known risk factors for preeclampsia, it is important to appropriately counsel women regarding this risk. The integration of family planning counseling with HIV services can be instrumental in improving outcomes in future pregnancies.

No cases of diabetes mellitus or systemic erythematous lupus were reported. Diabetes mellitus is a metabolic disease characterized by increased blood sugar levels and systemic erythematous lupus is an autoimmune disorder where the immune system attacks normal, healthy cells. All patients had a maternal age of greater than 20 and only one patient had a maternal age greater than 35. In those patients with no traditional risk factors, HIV and/or ART may play a role in the development of hypertension and the cascade leading to preeclampsia, eclampsia and HELLP; however, the relative contributions of HIV and ART to preeclampsia remain unclear.

Several hypotheses have been suggested about the mechanism by which ART predisposes patients to preeclampsia. Researchers have proposed that the immune restoration by ART increases a women's response to fetal antigens subsequently increasing the risk of preeclampsia.[9] Additional theories include liver toxicity induced by ART, which could contribute to the development of preeclampsia.[20] These hypotheses have never been tested and require further investigation.

Preeclampsia and Maternal and Infant Outcomes in HIV-infected Women

Preeclampsia can lead to poor maternal and neonatal outcomes. In our sample, one intrauterine fetal demise and no maternal deaths were reported. Of note, the one patient who developed intrauterine fetal demise progressed from preeclampsia to eclampsia at gestational week 39. In a retrospective study of 59 patients with eclampsia at a tertiary academic center in Nigeria, the rate of intrauterine fetal demise in this population was high at 13.5 %.[21] This data raises concern in regards to eclampsia as a cause of adverse neonatal outcomes. Additionally, the rates of emergency cesarean section increase in patients with preeclampsia can lead to further complications in the setting of immune compromise from HIV-infection, such as poor wound healing and postpartum infection.[22] In our population, we had two cases of emergency cesarean sections, and one of these deliveries was complicated by severe bladder injury. Earlier identification with optimal obstetric management of patients with preeclampsia can prevent the need for emergency cesarean section and associated complications, and improve overall pregnancy outcomes for both mother and infant.

Patients with preeclampsia in the South African population often present late in pregnancy[24], as do patients with HIV-infection. Many women are diagnosed with HIV infection during pregnancy because this is often their first interface with the health system as adults due to cultural and socioeconomic barriers that make access to healthcare challenging.[24] Among the five patients started on ART who developed preeclampsia in our study, only one patient was known to be HIV-infected and conceived on ART, suggesting that women are either belatedly diagnosed with HIV or are HIV-positive without proper access to the health system. Therefore, there is a critical need to identify HIV infection in women of reproductive age prior to pregnancy to prevent transmission to partners, to counsel and plan for healthy pregnancies and to improve overall pregnancy outcomes for the mother and infant. An integrated antenatal ART clinic can play an essential role in managing high-risk pregnancies by facilitating early ART and appropriate management of preeclampsia; however, there is a need for strategies within the broader HIV healthcare system to improve early identification for HIV-infected women, as well as improved retention of these women in care who are likely to have additional pregnancies in the future.

Limitations

Our study has several limitations, which reflect the challenges of providing HIV care for pregnant women in resource-limited populations. We were unable to report HIV viral load for every patient and CD4 cell data were limited since, at the time of data collection, these tests were performed infrequently due to lack of available funding. Additionally, we do not have data on body mass index, additional medical co-morbidities and detailed past obstetric history for patients in our study. This important information would be valuable in future studies as they can be important markers of overall health and these factors may be associated risk factors for poor outcomes in pregnancy.[25] There were several women who were lost to follow-up immediately after delivery. It is difficult to assess whether HIV and/or ART are associated with the development of

preeclampsia due to the small sample size of the case study. We do not have a denominator of the total number of HIV-infected women on ART who did not develop hypertensive disorders and therefore cannot report on incidence given the absence of controls in this study.

Conclusions

Preeclampsia and HIV are both major causes of maternal morbidity and mortality in South Africa. As the number of women of reproductive age with HIV continues to increase, it is important to assess the relationship of HIV and ART to obstetric complications such as preeclampsia. This case series explores the limitations in early detection of HIV and hypertensive disorders in pregnancy followed by timely interventions in preventing maternal and perinatal complications in resource-limited settings. Well-designed clinical studies are needed to explore specific contributions of HIV and ART to preeclampsia in HIV-infected women and to understand the optimal clinical management for women in these settings.

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Global health curricula in medical schools

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To meet the demand for increasing capacity of the global health (GH) workforce many medical schools worldwide are in the process of establishing GH curricula. Still, there is little consensus as to how to train future physicians with the skills, attitudes and knowledge required to meet the currents gaps in GH practice, policy, education, advocacy and research. Thus, the co-authors of this paper, all keenly interested and involved in achieving better GH education for medical schools, organized an open retreat to help address this. This paper summarizes the processes required and provides additional recommendations to fill this gap. Steps taken by the Medical School for International Health, a school which focuses on GH, and other schools and organizations (e.g., NOSM, GHEC, THEnet,) to establish GH competencies, education and training approaches, as well as outcome monitoring, and integration of teaching with communities, are reviewed. After guidelines were provided , we addressed topic areas important to GH medical education, such as competencies, planning methods of GH inoculation in curricula, GH clerkships, curricula monitoring and evaluation and principals of community interaction. We reviewed existing resources and processes in each area, identified gaps, noted barriers to implementation, and put forth recommendations for each topic area.

The Need

The current epidemics of Ebola, and obesity with its accompanying cardiovascular diseases, are now shared worldwide. With increasing globalization, and the realization that health problems in developing and developed countries are shared , students and faculty recognize that current medical education and training needs to increase the capacity of global health practitioners is often lacking. Approaches for how to address this are not consistent across academic institutions. To this end we planned a half-day symposium, "Global Health Curricula for Medical Schools - Processes Needed" which". It was held at Rendez-Vous 2012 on October 11, 2012 in Thunder Bay, Ontario, the purpose of which was to outline processes required and to provide recommendations to fill this gap. Rendez-Vous 2012 convened health professionals, educators and researchers from all parts of the world to share experiences, opportunities and challenges in education, service and research. Our symposium objectives were: 1) to understand the curricular components needed in medical schools for GH education and training 2) to plan approaches for integrating novel education and local community programs into medical schools and 3) to plan monitoring and evaluation of GH education. The symposium utilized framework presentations, roundtable discussions and break-out groups. The framework areas are summarized below and set the stage for very lively back and forth discussions between speakers, panelists and participants.

Global Health Competencies for Medical Schools

This topic was summarized by Richard Deckelbaum, an experienced practitioner of GH who addressed the question, "What is competency?" Competence is defined as the quality of being adequate or well qualified physically and intellectually.[1] The processes whereby an influential organization, the Global Health Education Consortium (GHEC) established such competencies for what every future physician needs to know in terms of GH were summarized [2]. The steps involved in establishing these competencies were carried out by the GHEC/Association of Faculties of Medicine of Canada Resource Group Joint Committee, which had representation from GHEC faculty members and students from Canadian and US medical schools. The Resource Group emphasized differentiating core knowledge from elective knowledge in terms of GH competencies. The GHEC GH competencies are available via the GHEC website reference.[2] Predominant areas for acquiring attitudes, knowledge and skills needed by all physicians include the following - the global burden of disease and its relationship to globalization, maternal and child health, human rights and health, nutrition and sanitation, health inequalities, tropical and infectious diseases and environmental health.

Additional competencies of GH practitioners, and how these might differ among specialized fields, still require more definition and inputs. For example, how do the GH competencies needed for public health practitioners compare to those needed by a medical practitioner? With these competencies, how might GH health practitioners and their parent schools impact better on their local and distant communities? With this framework, we then went on to discuss processes whereby medical schools can improve their roles to local and distant communities' well-being in part by strengthening GH curricula and opportunities.

Medical Schools as Catalysts for Greater Health Equity

A group of health-profession institutions have formed THEnet, a consortium "committed to achieving health equity through education, research and services responsive to community priorities."[3] THEnet, Training in Health Equity Network, emphasizes that GH should be framed around health equity and social accountability because socio-

economic, gender and ethnic disparities in medical care and health outcomes persist.

Since December 2008, several health profession institutions across the world, pioneering innovative models to address health workforce challenges in disadvantaged communities, have joined forces through THEnet. These institutions, confronted by the necessity to develop solutions that address the health equity gap in their region, have moved away from a predominant model of medical and health professional education, which has not included the local community in design and implementation of curricula. Dr. Andre-Jacque Neusy, who helped found THEnet, stressed that health professional education has not previously sufficiently kept pace with evolving social, health and demographic challenges that would reduce the GH equity gap.

THEnet, with its partners, conducts cross-institutional research and provides peer support and capacity development to increase the positive health impact of health professions schools. It has also developed an Evaluation Framework for Socially Accountable Health Professional Education.[3]

Dr. Neusy then gave examples of steps used by THEnet schools to adopt community-linked strategies; which include-

- Health and social needs of targeted communities guide education, research and service programs.
- Students are preferentially recruited from the communities with the greatest health care needs.
- Health professions education is embedded in the health system and takes place in the community and clinics instead of predominantly in university and hospital settings.

Community engagement is at the heart of their success and includes mobilizing and enabling communities to take responsibility for their own health over the long-term. Operating in very different contexts – from poor communities in the United States, remote indigenous communities in Canada and Australia, rural regions of Africa to urban slums and marginalized communities in the Philippines – THEnet schools have been remarkably successful. They have increased the number and quality of health workers and improved health outcomes in deprived areas. Their graduates' practices have also significantly improved. Thus, in emphasizing social accountability and community engagement, medical schools can be a critical tool to help dissolve/decrease the health equity gap.

The Medical School for International Health (MSIH) Approaches to Global Health Medical Education

In this vein, Mark Clarfield, the director of MSIH, the only medical school, to the best of our knowledge, which specializes in GH , described how this school was distinct from all other medical schools in ensuring that the skills, attitudes and knowledge relating to practicing GH are integrated into the curriculum for all students and not simply a "track" for those interested in GH. MSIH is housed at Ben-Gurion University Faculty of Health Sciences in Beer-Sheva, Israel, and has an affiliation with Columbia University Medical Center in New York.[4] MSIH structures its curriculum over four years, similar to most North American medical schools.

However, what is different is that studying in Beer-Sheva, Israel is already "a foreign global health experience" within a setting that includes new languages, and a variety of cultures, as well as a different health and medical care system. At MSIH, a specific course is presented in the first year focusing on the basic principles of GH and medicine. In the first two years, students choose four of ten different GH modules that include such topics as *Nutrition in Development*, *Aging in the Developing World*, *Comparisons of Healthcare Systems Worldwide*. Throughout the third year, which has basic clinical rotations similar to LCME-approved schools, cross-cultural and GH workshops are held utilizing role playing, guest experts, program patients and other tools in order to integrate GH into clinical training. The capstone GH experience is a two month, international elective during the fourth year where students spend one month in a rural primary-care health center usually located in less developed regions. Each site has a committed, local academic coordinator, has formed some association with Ben-Gurion University, and offers a well-organized and coordinated clerkship. To date, country sites for these international electives have included among others India, Ethiopia, Kenya, Uganda, Nepal, Vietnam, Peru, and Israel.

Dr. Clarfield commented on challenges for students at MSIH which include the distance from home, language barriers, cultural differences, and for most US students, high loan burdens. Nevertheless, even with these challenges, according to data from on-going follow-up questionnaires sent to MSIH alumni, from the first of the six classes greater than 75% of MSIH graduates are contributing meaningfully to GH in teaching, research, and practice.

Examples of local GH activities include students at MSIH actively working with social services in Beer-Sheva to meet and understand community family social and health conditions with personal visits to "problem" households at least monthly. MSIH students also participate in special refugee clinics and other activities outside the medical school providing services to disadvantaged groups.

Dr. Kate Horan, an MSIH graduate, then described how students and faculty at MSIH formed a Global Health and Medicine (GHM) working group of eight students (two from each year) and faculty members who serve as the GHM course coordinator and GH curriculum director. Their mission was to facilitate the academic and professional growth of MSIH students' GH knowledge and skills. In designing and structuring this course the GHM group used inputs from class surveys, systematic review of available curricula, different GH sites and organizations, and reports from various conferences and committees. The course outlined different primary GH competencies, in parallel to those of the GHEC competencies, and these included knowledge on GH organizations, global burden of disease, cross-cultural medicine, vulnerable populations, primary care and GH ethics.

For each of these overall competency areas subgroups were defined; for example, under GH organizations the factors relating to the history of GH, GH organization and efforts, health systems and factors relating to health economics are reviewed. Resources recommended for the GHM course included GH textbooks, a course-pack that was produced by the GHM working group, as well as case studies produced by the group. The course-pack includes GHM curriculum overviews, human rights overviews, book recommendations, GH resources, the course syllabus, readings and additional resources. Recommended steps needed in implementing a GH curriculum include forming a central working group/ committee (student/faculty), creating a mission statement and defining goals, obtaining the permission from school administration in terms of hours available, possible credits, and resources available, identifying steps needed to integrate competencies into the curriculum and evaluating of the GH curriculum by faculty and students.

Integrating Local Communities into Medical Education

Aboriginal communities are especially important in GM curricula and the location of the academic meeting at which this symposium was held underlined this aspect of GH. The Director of Aboriginal Affairs at The Northern Ontario School of Medicine (NOSM), Tina Armstrong, emphasized that aboriginal communities are multi-dimensional and dynamic, whereas post-secondary educational institutions and health organizations tend to be much more structured and rigid in form and function. This highlights the need for students and faculty to remain open in their perspective and attentive to what the communities suggest are priorities for improving their social and health status. It was pointed out that in order to gain trust, it is important to note that the following Principles of Aboriginal Community Engagement are kept in mind through the development of school-community relationships and curriculum as follows:

- Becoming knowledgeable and understanding of each other - This is key in the integration of local communities and medical education.
- Establish relationships, build trust, work with the formal and informal leadership, and seek cooperation and commitment from community organizations and leaders - Commitment can be validated and enhanced with community voices, stories, and feedback.
- Understand that community self-determination is the responsibility and right of all people who comprise the community - Understand predominating community notions of knowledge, language, and customs and how they affect the actions of individuals.
- Partner with the community to identify or create the necessary support to achieve the purpose - True partnership with the community involves transparency, communication and asking what the community needs. Have the community provide information as to what is needed to create that necessary support.
- Recognize and respect community diversity - Identify influential individuals within the community that can assist in creating a higher level of understanding of the community and the diversity of the nation in which this commu-

nity is located.
- Accept and be prepared to release control of health and non-health related actions or interventions to the community - Be flexible to meet the changing needs of the community through the self-identification and self-reflection of one's location.
- Understand that community collaboration requires long-term commitment by the institution and community partners - Respect the partnership through meaningful dialogue and being cognizant of the application of partnerships.

The above presentations sucessfully set the stage for very active give and take discussions relating to issues in GH training. For example, should a medical school curriculum include substantial immersion and training in local communities, both aboriginal and non-aboriginal? It was of interest that NOSM students viewed this issue as somewhat outside the purview of GH, because their experience in local communities was in Canada and not in a developing country. But other students and faculty from outside of NOSM suggested that much of the NOSM-type training did indeed fit into the true definitions of GH, especially at the local level. (NOSM, one of the founding members of THEnet, integrates its curriculum and training into, and with, local communities.) Discussions were held regarding whether GH truly does fit into "local" health missions in low-resourced communities in so-called developedcountries. Still, students from NOSM argued for more exposure to health settings in underdeveloped countries although the aboriginal communities in Northern Ontario do share many common barriers and health problems with local communities in developing countries.

Another topic of active interchanges related to GH "clerkships" and the role of students in building GH curricula. Participants in the workshop questioned whether one needs to first undergo the basic medical clerkship training in different clinical areas, e.g., medicine, surgery, pediatrics, etc., before having an effective GH clerkship. A number of participants suggested that students could contribute in terms of service - learning programs and projects before they have completed their clinical clerkship trainings. Finally, participants strongly stressed the need to better utilize inputs from students along with closer student-faculty collaboration and interaction, in building GH curricula.

Conclusions from Breakout Groups

After the roundtable discussions, the audience and the speakers divided into breakout groups. The groups met to further discuss important areas relating to GH education and training. These included GH competencies, GH clerkships, teaching and inoculation approaches for GH in medical schools, and monitoring and evaluation of GH curricula and outcomes. The groups were charged with reporting on information and/or approaches that are currently available for the topic areas, identifying gaps in current information and/or approaches, providing recommendations to address gaps and improve current approaches, defining the existing or potential barriers to implementing the recommendations, and suggesting timelines and monitoring and evaluation approaches for the recommendations where appropriate.

After their meetings, summaries from the breakout groups were presented and integrated in a plenary session in the following areas:

Global Health Competencies and Curriculum

Participants agreed that while GHEC [2], MSIH and other schools are initiating GH competencies, there are still no formal or recognized and externally accredited set of such competencies in medical school curricula and that efforts to establish them are most welcome. Very few surveys or reports exist on evaluation of GH competencies. In addition, there is insufficient tracking of students in graduate outcomes in terms of GH learning and career commitments. The participants suggested that there is often a lack of communication between faculty and GH student interest groups in individual medical schools and, as well, in GH organizations.

In terms of monitoring and evaluation current surveys tend to be very quantitative and may be measuring the wrong "endpoints." Recommendations were provided to improve achievement of GH competencies and improve GH curricula as detailed in Table 1.

Recommendations about how to better monitor and evaluate GH curricula were then presented with examples of specific steps needed as follows:

- Use qualitative focus groups more effectively and frequently in order to facilitate the setting of priorities based upon community as well as student perceptions as to what is needed in learning skills, attitudes, and knowledge relating to GH. Focus groups should include students, faculty, and community members.
- Give more attention to qualitative analyses
- Use improved evaluations for assessments of clinical encounters in the community and in health centers
- Improve tools for evaluation of preceptors and of student's skills by the preceptors
- Establish guidelines for "two-way-streets." This involves an emphasis on what the healthcare students and professionals can obtain from the community and what can be given back to the community
- Establish timelines and metrics for monitoring and evaluation for GH curricular and competency components

Table 1: Recommendations to improve GH curricula

- Promote more interaction and involvement of students, and faculty with senior leadership in medical schools - Establish a framework of GH competencies which will be agreed upon by associations of schools, faculty and students - Translate GH competencies into specific learning objectives - Weave or "inoculate" GH into existing curricula (e.g., when studying liver transplantation, consider its economic, ethical, moral, and other aspects in different healthcare settings)

Global Health Clerkships and Integration with Communities

While many schools provide GH clerkships for students in diverse communities, a number of concerns were raised which include:

- Unsupervised clerkships that end up merely offering "medical student tourism"
- Clerkships may have little effect on the community
- What objectives are the clerkships achieving in terms of wellbeing in the community, for patients possibly receiving unsupervised care as well as emotional and cultural interchanges between students and the community? Students working in the community should place no burden on the community itself.
- Students need to be better prepared for their community clerkships through improved a) understanding of their goals and roles; b) use of local languages (at least a few key words); and c) knowledge of and integration into local culture
- The community needs to be better prepared to provide peer support from within the community, and, like the students, the community needs to be involved in preparing for interaction with students, and to identify and improve problems at a community level

In summary, this symposium on "Global Health Curricula for Medical Schools - Processes Needed" assessed useful and practical information as to what is currently available to improve GH teaching in medical schools, identified gaps relating to GH training, and provided a substantial number of concrete recommendations to increase human resource health capacities along with community "win-win" interactions for GH practitioners, academics and researchers in different settings. Of relevant interest, a common theme in discussing GH is that barriers and solutions to solve problems in developing countries and countries in transition are commonly shared with populations in developed countries. Many of the economic and health disparities in the neighborhoods surrounding Canadian and U.S. medical school campuses are shared by and are being worked on in the developing areas in Latin America, sub-Saharan Africa and southeastern Asia. It is of significance that some of the solutions now being provided in these lower income settings might be applied locally in North America as well as other areas in the "developed world". In fact, weakening of the borders between what is important locally and what is happening globally has led to the increased utilization of a new word - "glocal." Of satisfaction to all participants at the symposium, we came away with the message that improved GH curricula in medical schools can and should be a major contributor to improving individual and population well-being both in their local communities and internationally.

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A bitter pill to swallow: the problem of, and solutions to, Sub-Saharan Africa's counterfeit pharmaceutical trade

Silas Webb

Counterfeit pharmaceuticals pose a considerable threat to human health and well-being worldwide. Despite appearing indistinguishable from the genuine drugs that they imitate, fake drugs often have little therapeutic value, can seriously exacerbate the illness of patients by giving them a false sense of security and can sometimes even adversely affect the user's health. Their sub-therapeutic nature also contributes to the increasing problem of drug resistance, especially to chronic infectious diseases such as malaria, tuberculosis and HIV.

In spite of its global nature, the counterfeit pharmaceutical trade does not affect all parts of the world equally. The World Health Organization estimates that fake drugs account for up to 50% of drug sales in Sub-Saharan Africa but only 1% in the developed world1. This literature review will discuss the social, economic and legal reasons for the region's vulnerability to the counterfeit pharmaceutical trade.

This review concludes that the actual scale of the problem in Sub-Saharan Africa is inadequately evidenced. Methodologically poor research, commonly cited "estimates" with no empirical evidence, illegal activity and media sensationalism help conceal the true prevalence of fake drugs. However, a compilation of the most accurate data available suggests that counterfeit drugs account for a third of the pharmaceutical trade in the region.

Despite the repercussions of this trade for human health, the international and national policies necessary to tackle counterfeits in most of Sub-Saharan Africa have often been inadequate or nonexistent. In contrast, the Nigerian government has effectively tackled counterfeiting over the past decade by implementing multifaceted policies that have helped reduce the prevalence of counterfeit drugs by 80% between 2001 and 2006. This positive case study can potentially act as a model for improvement in other Sub-Saharan African countries.

Introduction

The huge threat posed by counterfeit medicines to global public health has become increasingly apparent over the last decade. Counterfeit medicines were first acknowledged as an international problem at the World Health Organization's (WHO) conference on 'The Rational Use of Drugs' in Nairobi in 1985.[1] However, it took until 2006 for the WHO to officially condemn the practice, by producing the Declaration of Rome. The Declaration of Rome was the first acknowledgement that tackling the issue of counterfeit drugs requires "effective coordination and cooperation at the international level for regional and national strategies to be more effective."[2]

Although counterfeit pharmaceuticals represent a truly globalized problem, the prevalence of fake drugs in different countries varies widely: counterfeit drugs account for up to half of drug sales in the poorest countries in Sub-Saharan Africa (SSA), but only about 1% in the developed world. In general, almost all types of drugs have been counterfeited, but different types are counterfeited in different regions of the world.[3] In the developed world, counterfeiters tend to focus on expensive life-style medications such as anti-allergic agents and Viagra.[3] However, in the developing world, where there is a huge burden of infectious disease, counterfeiters target life-saving drugs for deadly conditions like malaria, human immune deficiency virus (HIV) and tuberculosis (TB).[4] Thus, counterfeit medicines also play a role in magnifying global health inequalities.

The Scale of the Problem

Difficulties in estimating prevalence:

Due to the underground nature of the counterfeit drug business, it is difficult to get a valid figure for the global scale of the trade. The International Medical Products Anti-Counterfeiting Taskforce (IMPACT) asks how one can "measure a market, that, by its nature is illegal."[5] Therefore, all estimates have to be treated with caution. This data vacuum has caused published estimates of counterfeits to vary from one to 50% of all global pharmaceuticals.[6] Media speculation on the subject is frequently sensationalized. A commonly cited statistic originating from a Chinese state newspaper claims that "192,000 people die every year in China as a result of counterfeit drugs," but this has since been proven to be a mistranslation.[7] The actual statement was that "192,000 people die of irrational drug use every year in China", which includes deaths by inappropriate prescriptions and poor pharmaceutical compliance. Therefore, the figure cannot be used interchangeably with counterfeit pharmaceuticals. Even the data cited by

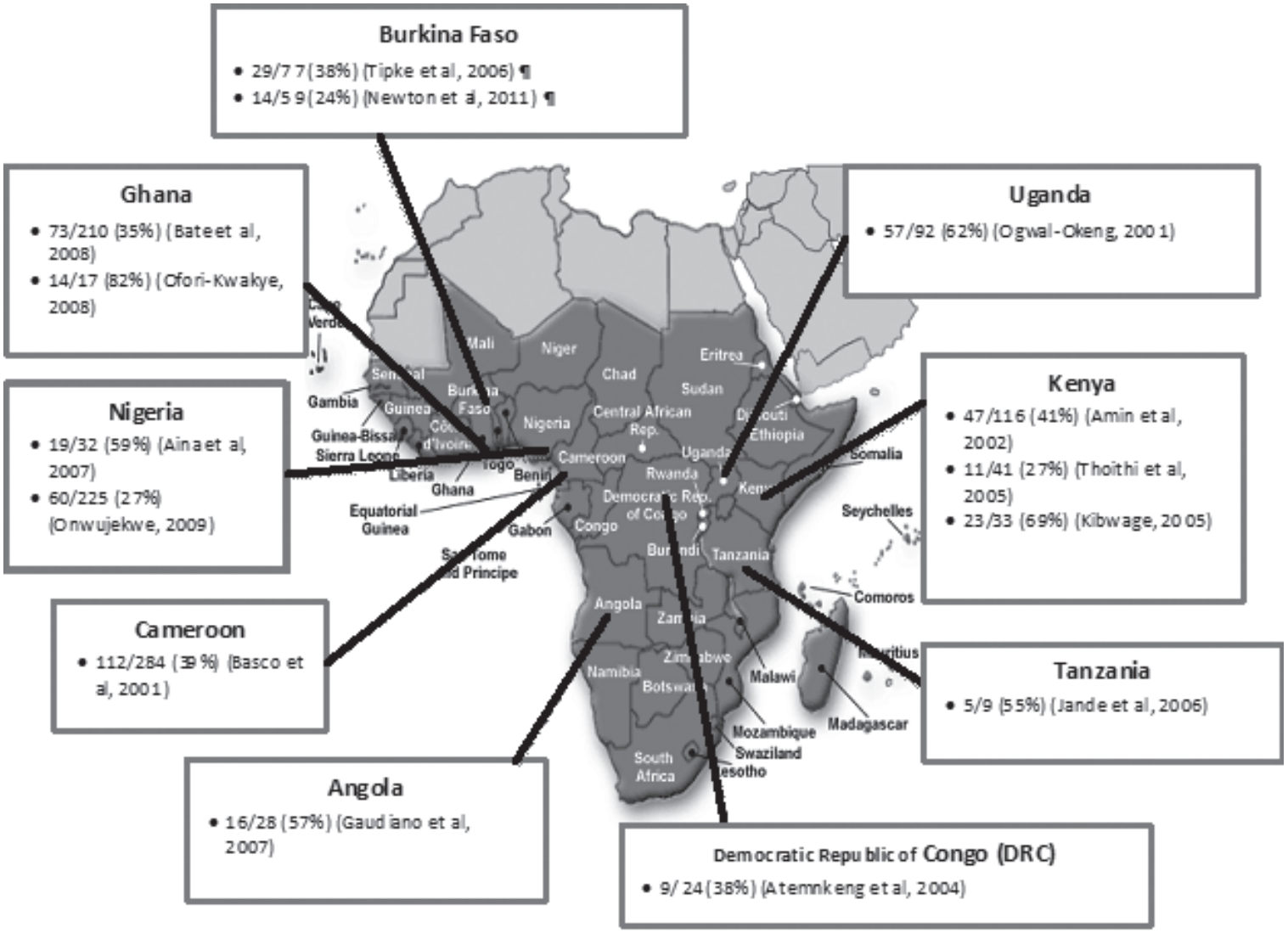

Figure 1 Comparison of 14 studies of counterfeit anti-malarials in the region of SSA between 1999-2011:
(Number of sub therapeutic anti-malarials/number of sampled anti-malarials) Collation of 14 studies measuring the prevalence of poor-quality anti-malarials in SSA by chemical analysis.
¶ = Also used packaging analysis (Appendix 1)

trusted international agencies are based on little more than informed guesswork: the WHO estimates that 10% of the world drug trade is counterfeit and IMPACT put the figure between 10 and 30%, but neither of these figures is based on published scientific research.[8]

In addition to problems with the reliability of the available research, there are also claims that important data about counterfeit drugs are being kept secret.[4] The WHO does not mandate countries to keep records or report incidences of drug counterfeiting. Thus, nearly all prevalence records in the public domain come from those detected by private pharmaceutical companies. It has been argued that a large amount of data regarding false drugs is being withheld from the public,[9] as fake drugs damage the brand image of pharmaceutical companies.[10] This issue was highlighted by a spokesperson for the Association of the British Pharmaceutical Industry (ABPI) who said that it is a challenge to declare a counterfeit drug problem without "damaging legitimate business."[9]

Estimating the global market of counterfeits

The worldwide exposure to counterfeit drugs can be estimated by referring to drug seizures. The Pharmaceutical Security Institute (PSI), a network of the security divisions of 25 major pharmaceutical companies, claims that it has made counterfeit drug seizures at customs checkpoints in 123 different countries: according to them, no region of the world is exempt from the trade.[11] The increasingly globalized nature of the pharmaceutical market, the proliferation of free trade agreements worldwide and the spread of internet pharmacies have all but left very few areas affected by counterfeit medication.

Estimating the prevalence in SSA

While the richest countries offer the most lucrative market for counterfeiters, they also have the most advanced techniques for combatting them.[12] In contrast, the poorest third of WHO member states have either no means or very limited means of controlling counterfeit medicines.[13] Many of these countries are found in the Sub-Saharan region of Africa, which is home to the 15 poorest countries in the world according to the Human Development Index (HDI).[14] The WHO estimates that 30% of all medicines in Sub-Saharan Africa (SSA) as opposed to 1% in the developed world may be counterfeit, suggesting a link between impoverished regions and their inability to restrict counterfeit medicines.[12]

Unfortunately, the Sub-Saharan region of Africa offers minimal or no national reporting on seizures of counterfeit drugs.[15] Published data seems to underestimate the prevalence of falsified drugs in SSA. To provide a more accurate picture of the counterfeit drug problem in SSA, 14 small-scale domestic studies looking at the prevalence of fake anti-malarials in the region were analyzed (Figure 1). Over 90% of worldwide malaria deaths occur in Africa, creating a huge market for criminals to produce counterfeit anti-malarials in the region.[16] In addition, in 2006, the WHO changed their official guidelines for treating malaria to Artemisinin Combination Therapy (ACT), which although more efficacious than chloroquine, costs between five and 23 times as much to manufacture.[17] As a result, this market has become particularly lucrative for counterfeiters. Nayyar's survey published in the Lancet found that 35% of 2297 anti-malarials sampled from across SSA were

of sub-therapeutic quality.[18]

This comparison study (Figure 1) found that 489 out of 1247 (39.2%) of anti-malarials in nine Sub-Saharan countries failed chemical analyses, reaffirming Nayyar's previous estimate of 35%.[18] Although there is a huge problem of poor-quality anti-malarials in SSA, they are not all necessarily counterfeits. According to the WHO's definition of counterfeit drugs, both chemical and packaging analyses are needed to label drugs as counterfeit. Only the two studies in Burkina Faso used both analyses and could therefore confidently predict that the failures in the sample were falsified. Together these two studies showed that 32% of the sampled pharmaceuticals were counterfeit, highlighting that a large proportion of the anti-malarials, which failed chemical analyses in the other seven countries, could indeed be counterfeit.[19, 20]

The best estimation of the burden of counterfeit drugs in SSA would be from a large, multi-country study using systematic random samples from a representative sample of drug sellers.[21] There are few such studies because they are logistically complicated and expensive, so collations of small-scale prevalence studies are the best current approximation of the scale of the problem.[21]

Factors encouraging pharmaceutical counterfeiting

High prices, low overheads:

Pharmaceuticals represent a financially attractive field for counterfeiters. They are high-priced in relation to their bulk and have an infinite capacity for demand.[1] According to the WHO, over 70% of counterfeit drugs contain insufficient or no active pharmaceutical ingredients (API), so ingredient costs are minimal,[1] and some of the more rudimentary fake pills contain just flour or chalk.[22] Production does not require large infrastructure and the necessary technology is readily accessible to many counterfeiters who use only crude facilities to produce drugs: many are made in small cottages or backyards.[1] Unlike legitimate pharmaceutical producers, counterfeiters do not have to go through quality assurance procedures, meet Good Manufacturing Practices (GMP) standards or have an outlay on future research and development, all of which result in lower overhead costs.[1]

High drug prices are the predominant barrier to patients accessing legitimate medicines in the developing world. Because criminals can make fake drugs so cheaply, they are able to sell them at marked-down prices. Noam Chomsky, one of America's most prominent political commentators, argued that counterfeiting is simply a reaction to the extortionate prices imposed by the pharmaceutical industry.[15] Pharmaceutical companies assert that they are not responsible for the high prices.[15] In fact, the existence of import tariffs has been identified as a major reason why good-quality, legitimate drugs cannot compete with fake ones on price. In an effort to expand their economies, many governments in low-income countries impose tariffs on good-quality, imported drugs, and as a result drive up the costs for the overseas pharmaceutical companies, preventing them in some cases from entering the market at all.[5] In contrast, the WHO found that 72% of economically developed nations did not impose import tariffs on pharmaceuticals, which helps to prevent counterfeit drugs from entering these markets.[5]

Up to 90% of inhabitants in SSA have to pay for essential medicines,[23] so those seeking treatment choose the cheapest medicines available, a position often filled by counterfeits.[12] In addition, many people are oblivious to the danger of buying the cheapest drugs: a qualitative study in Tanzania reported that 96% of people had never heard that drugs could contain lower than advertised amounts of ingredients.[24] Even consumers who are aware of the correlation between reduced costs and increasingly poor-quality pharmaceuticals may be willing to overlook this correlation if the price is low enough. Whilst investigating the 'Consumer Behaviour Towards Counterfeit Drugs (CBTCD),' pharmaceutical analyst Dr. Abubakr Alfadl invented a scale to empirically quantify CBTCD, which he tested on 100 Sudanese consumers.[25] He concluded that consumers in Sudan may "intentionally buy counterfeits" if they are cheap enough, because they are still believed to have some therapeutic qualities.[25] Policy makers have traditionally focused on improving regulation on the supply side of counterfeit drugs, but this study highlights the need to focus on increasing public awareness of the health risks about counterfeit drugs to reduce their demand.

Lack of regulation

Pharmaceutical manufacturing and supply systems are particularly susceptible to corruption as they consist of many different stages and suppliers. Manufacturers, importers, wholesalers, prescribers and pharmacists are all part of the pharmaceutical supply chain, and each needs regulation and transparency to ensure that counterfeits cannot enter at their level.[26] To improve pharmaceutical regulation, the WHO stated in its 1999 'Guidelines for the Development of Measures to Combat Counterfeit Drugs' that it was paramount for every country to establish a National Medicine Regulatory Authority (NMRA) to be "accountable for the overall effectiveness of medicine regulation".[27] The core roles of an NMRA include controlling pharmaceutical registration and post-production surveillance as well as governing the licensing and inspection of manufacturers, distributors and sellers of drugs.

Despite many countries in SSA having NMRAs, the WHO estimates that many of them are not operating effectively enough to prevent counterfeits from infiltrating the market. Currently, of the 191 WHO member states, only 20% are known to have well-developed drug regulatory bodies, all of which are in the most economically developed nations.[28] A study published by the WHO in 2010 collated assessments of the effectiveness of NMRAs in 26 Sub-Saharan countries in identifying the problems in pharmaceutical regulation; they found that there was a common lack of sustainable funding and a shortage of qualified staff in all 26 NMRAs.[18] More specifically, 81% of the NMRAs had either inadequate or no quality-monitoring programs in place to detect counterfeit and substandard medicines.[27] Even if poor-quality batches of medicine were detected, only 12% of the NMRAs were able to perform an effective pharmaceutical recall.[27] This lack of official traceability explains how drug counterfeiters often escape with no punishment even when seizures are made.[4]

The WHO also recommends that all NMRAs should run specific anti-counterfeiting inspection programs with chemical and packaging analyses to differentiate falsified medicines from substandard ones.[27] However, only five of 26 (19%) of the NMRAs in the study (Zambia, Botswana, Senegal, Cameroon, Djibouti) had implemented these programs and none of them were comprehensive enough to meet the WHO's guidelines.[27]

Corruption

Just as the complex, multi-layer structure of the worldwide pharmaceutical system makes it difficult to regulate, this structure also provides many openings for exploitation. According to a senior economist at the World Bank, corruption within the healthcare systems of developing nations is widespread and opens the door for the bribery of customs officials.[12] One unnamed NMRA within SSA was found guilty of taking bribes to allow the passage of falsified drugs into pharmacies by charging wholesalers $65 a month to allow their illegal business to continue.[6]

The often-unstable economic and political environments in SSA have not only created an opening for corrupt pharmaceutical sellers, but also have offered a means of supplementing the meager incomes of individuals working in the pharmaceutical sector.[26] A study in Uganda found that 68-77% of pharmaceutical workers had stolen and resold publicly procured drugs at least once and that 80% would be open to the possibility of taking bribes from drug distributors.[26] The unlawful nature of corruption means that empirical evidence rarely exists to prove its presence. However, anecdotal evidence and assumptions from informally published literature suggest that the practice is widespread.[1] Corruption is also present in developed nations, but with more transparent reporting systems, the threat of severe punishments and higher incomes for health professionals the problem is vastly reduced.[5]

Problems with jurisdiction

Unlike many other counterfeit products, medicines are almost always destroyed upon ingestion; Wertheimer describes this as the "perfect crime" because the victim eradicates any evidence of wrongdoing.[4] Even on the rare occasions when authorities are able to catch criminals involved in this industry, they tend to receive lighter penalties than those involved in other illegal trades, attracting criminals previously involved in narco-trafficking to drug-counterfeiting.[12] As the head of corporate security for the multinational pharmaceutical company, Novartis, puts it: "if you get caught with a pound of cocaine, you can expect to do serious time. But if you are found with counterfeit medicines, you might only do six months".[12] The WHO echoed this perspective when they stated that "weak penal sanctions" for counterfeiters was a major factor in the proliferation of spurious drugs.[1]

Figure 1 Comparison of 14 studies of anti-malarial quality in SSA

Author (Publication date)	Country	Year(s) sample collected	Drugs sampled	Method of testing	Sampling technique	Packaging analysis
Tipke et al (2008)[19]	Burkina Faso	2006	Artesunate, Quinine, Pyrimethamine	Disintegration analysis, colorimetry, TLC	Convenience	Yes
Newton et al (2011)[20]	Burkina Faso	2002-2010	Artesunate, Dihydroartemisinin, Halofantrine	HPLC, Mass spectrometry	Convenience	Yes
Ogwal-Okeng (2003)[38]	Uganda	2001	Chloroquine	HPLC	Convenience	No
Amin et al (2005)[29]	Kenya	2002	Sulfaxdoxine-Pyrimethamine	HPLC, Dissolution tests	Convenience	No
Thoithi et al (2008)[39]	Kenya	2001-2005	Dihydroartemisinin, Quinine, Pyrimethamine	Uniformity of weight, API testing	Convenience	No
Kibwage (2005)[40]	Kenya	Not provided	Sulfadoxine-Pyrimethamine	Dissolution analysis	Convenience	No
Jande et al (2006)[24]	Tanzania	Not provided	Sulfadoxine-Pyrimethamine	Dissolution analysis	Convenience	No
Atemnkeng et al (2007)[41]	DRC	2004	Artesunate, Dihydroartemisinin	HPLC	Convenience	No
Guadiano et al (2007)[42]	Angola	Not provided	Quinine, Chloroquinine, Mefloquine	HPLC, Disintegration analysis	Convenience	No
Basco et al (2004)[43]	Cameroon	2001	Chloroquine, Quinine, Pyrimethmine	Coloriemtry, TLC	Convenience	No
Onwujekwe et al (2009)[44]	Nigeria	Not provided	Artesunate, Chloroquine, Quinine	HPLC, Dissolution analysis	Convenience	No
Aina et al (2007)[45]	Nigeria	Not provided	Chloroquine	Dissolution tests, API testing, Disintegration analysis	Convenience	No
Ofori-Kwakye et al (2008)[46]	Ghana	Not provided	Artesunate	Colorimetry, Disintegration analysis	Convenience	No
Bate et al (2008)	Ghana	Not provided	Artesunate, Dihydroartemisin, Sulfadoxine-Pyrimethamine	TLC, Dissolution analysis	Convenience	No

Attaran argues that the root of the problem stems from the lack of an international legal framework to punish counterfeiters in what is an increasingly globalized trade.[2] As it stands, if a criminal from one country produces and exports falsified drugs to another country, only the exporting country has the jurisdiction to prosecute the counterfeiter because the crime was committed on that country's territory. In contrast, the importing country, whose citizens have been harmed by the drugs, can only prosecute the people who have, sometimes unknowingly, let the drugs enter the domestic supply chain.[2] If caught, which is rare, these middlemen are charged with lesser crimes such as fraud, which will not carry a penalty appropriate for the damage caused.[2]

The inconsistencies in the national penalties for counterfeiting medicine make internationalizing the jurisdiction even more difficult.[18] In some developing nations, where strong judicial and policing systems are not yet in place (e.g. Somalia), counterfeiting pharmaceuticals is not even considered criminal.[5] On the other hand, others have introduced draconian criminal punishments: both China and India have introduced the death penalty for certain offences related to drug counterfeiting, but neither have invoked it.[5] Extradition laws require "dual criminality," in which a person is only extraditable from a country if he or she and the country requesting extradition have comparable penalties for the crime.[2] With such different national penalties for pharmaceutical counterfeiting, criminals often can avoid extradition and hence face the charges.[2]relatively light charges[2]

Impact on Health

The growing disparity in pharmaceutical access between the "Global North" and "Global South" is one of the biggest factors contributing to global health inequalities. Approximately two billion people lack access to essential medicines worldwide with the majority of these living in SSA and South-East Asia.[26] The higher prevalence of counterfeit medicines within these nations only worsens health inequalities. The most common effect of fake drugs on health is prolonged or unsuccessful treatment, but in the case of malaria, where disease progression is rapid, giving sub-therapeutic drugs is said to be "tantamount to murder".[29] Overall, Harris estimates that 700,000 deaths a year from malaria and TB in SSA are attributable to fake drugs.[5]

Counterfeit drugs with low doses of APIs have a greater potential for causing harm than those containing no APIs at all because of the damaging consequences of drug resistance to the entire community.[3] For diseases that are treated with combination therapies (e.g. malaria, TB and HIV), counterfeit medications have contributed to the emergence of resistance in these infectious organisms.[1] The correlation between counterfeit pharmaceuticals and drug resistance has been explored in the most detail with respect to malaria in which drug resistance has hampered attempts to eradicate the disease.[18] Of the twelve most prescribed anti-malarial drugs, there are confirmed reports of eight being counterfeited.[20] Within SSA, Plasmodium falciparum, the most deadly strain of malarial parasites for humans, is now frequently resistant to two previously effective therapies: chloroquine and pyrimethamine.[3] Molecular research has shown that the parasites, resistant to chloroquine and pyrimethamine developed in Africa, result from poor-quality pharmaceuticals produced in South-East Asia.[30] These two drugs are the most affordable treatments for malaria, so resistance to them is particularly threatening for the resource-poor nations of SSA where malaria is endemic and 90% of global malaria mortality occurs.[16]

Bate argues that the problem of TB resistance caused by counterfeit medicines poses an even greater threat than that of malaria but is being comparatively neglected by the public health community.[31] Poorly treated malaria can lead to the death of an infected child within 48 hours of disease onset, so the strains have fewer opportunities to develop resistance from counterfeits.[31] TB is less acutely fatal than malaria, but treatment courses are significantly longer (minimum of 6 months). Therefore, the risk of developing resistance is increased.[32] The reality of this problem has been highlighted in a study of rifampicin samples in 19 African cities, which found that 55.4% of 713 samples contained intermediate doses of the API, an amount insufficient to kill the drug-resistant bacilli that cause resistant strains of TB.[33]

Implications for policy

The WHO is a major stakeholder in the campaign against the counterfeit pharmaceutical trade, because fake drugs breach the patient's right to health, which is enshrined in the WHO's constitu-

tion.[15] In 1999, the agency released 'Guidelines for the Development of Measures to Combat Counterfeit Drugs', which proposed national strategies to tackle the practice.[15] Then in 2006, the 'International Conference on Combating Counterfeit Medicines' produced 'The Declaration of Rome'. This was the first acknowledgement that tackling the issue of counterfeit drugs requires "effective coordination and cooperation at the international level for regional and national strategies to be more effective".[2]

Following the Declaration, the WHO member-states pledged to work together to address the global challenge of pharmaceutical counterfeiting by founding IMPACT.[12] This was the first multi-lateral partnership set up specifically to tackle this increasingly worldwide issue; it included representatives of 193 national governments and their NMRAs, pharmaceutical manufacturers, NGOs and Interpol, the largest global police organization.[12] IMPACT's founding intention was to eradicate counterfeit drugs from all supply chains by 2015.[4] To accomplish this mandate, IMPACT focuses on five specific areas that are in need of international action:[34]

1. Encouraging national governments to establish laws, or strengthen existing legislation, against pharmaceutical counterfeiters.
2. Improving regulation to ensure that suitable agencies (NMRAs) are responsible for monitoring all manufacturers, exporters, distributors and retailers of pharmaceuticals.
3. Working with Interpol to break up counterfeit smuggling networks and track the flow of drugs. IMPACT offers courses to national police services on how to tackle the problem and trains 300 law enforcers specializing in anti-drug counterfeiting every year.
4. Offering education on how technology can be used in specific countries for detecting counterfeit drugs.
5. Raising awareness of the risk of counterfeit pharmaceuticals for both government policy makers and the general public.

The WHO has achieved some successes in harmonizing and coordinating the fight to eradicate counterfeit pharmaceuticals. As well as universally defining counterfeit pharmaceuticals and founding IMPACT, they have also taken innovative steps to improve the reporting of counterfeit pharmaceuticals around the world through the online Rapid-Alert System (RAS), allowing NMRAs to quickly report batches of counterfeit pharmaceuticals.[18] RAS has been piloted successfully in the Western Pacific region where it is said to have improved up to date monitoring of the situation and promoted the swift follow up of reported cases by the police.[28] A worldwide expansion of RAS will help improve coordination of the global response against fake drugs.

However, after examining the prevalence of counterfeit pharmaceuticals currently in worldwide circulation, it is fair to assume that the WHO's goal of eradicating counterfeit drugs by 2015 will not be achieved, even though their representatives still believe it is achievable in the near future.[34] Moreover, the international trade lawyer Amanda Chaves argues that the WHO's current focus on improving national awareness and legislation will not alone be effective in eliminating counterfeit drugs from the supply chain.[35] She claims that a more effective solution would be to enact a multi-lateral treaty to make pharmaceutical counterfeiting an international crime.[35] In legal terms, crimes are escalated to international crimes if they "amount to an offence against the entire international community", and since they increase drug resistance, falsified pharmaceuticals fall under this rubric.[2] Aircraft hijackings and narcotics trafficking have been made international crimes by way of international treaties in recent decades, and Attaran argues that drug counterfeiting confers similar dangers to life.[2] The WHO Constitution of 1948 permits the organization to "propose conventions, regulations and recommendations" on matters of public health, and if a 'supermajority' of two thirds of member states agree, a treaty can be adopted.[2] The WHO has only once exercised its power to make treaties with the 'Framework Convention on Tobacco Control (FCTC)', which included drafting an international law against the illicit trade of tobacco products.[2] This treaty set a public health precedent that the WHO should be able to use in the future to make pharmaceutical counterfeiting an international crime.

International governance is particularly important for stopping counterfeits in SSA because many of the drugs are imported into the continent via bilateral and multi-lateral donors and aid agencies. Many of these philanthropic agents do not ensure that the quality of the drugs they send is reliable.[12] The Global Fund to Fight AIDS, TB and Malaria (GFATM) spends millions of pounds every year to distribute essential drugs to Africa, but only 56% of these drugs come through suppliers approved by the WHO.[12] Although no studies have examined the quality of the medicines brought into SSA by donors, the lack of regulation may lead to them unknowingly bringing counterfeit medicines into the supply chain. It is essential that WHO and IMPACT hold these aid agencies accountable for the sourcing of their drugs.

Despite this being a globalized issue, it is over-simplistic to suggest that there is a standard solution applicable to all countries trying to eradicate the problem. Alongside the work done by the international community, every country has its own role to play in tackling the counterfeit of pharmaceuticals.[36] All nations within SSA have different degrees of dependency on domestic and overseas manufacturing of drugs as well as uniquely different supply chains and distributors, which impact the frequency and dissemination of counterfeit drugs within that country. Therefore, each country has to develop policies based on its own situation, infrastructure and resources.[36].

The experience of Nigeria provides an instructive case study for SSA. Nigeria is commonly cited as a nation that has gained notoriety for saturating the African pharmaceutical market with fake drugs but has recently attempted to regain its reputation in world markets by implementing innovative policies to thwart counterfeiters.

National Case Study: Nigeria

During the latter part of the 20th century, Nigeria had the biggest market of counterfeit pharmaceuticals in the world.[12] In 1987, a nation-wide study of the quality of Nigeria's pharmaceuticals found that 70% of drugs in the country were falsified.[10] The problem was brought to the attention of the worldwide media following the 'paracetamol syrup disaster' of 1989, in which 109 children died in the Jos region of Nigeria after taking counterfeit paracetamol syrup containing the toxic solvent, diethylene glycol.[47] In response, the Nigerian government established 'The National Agency for Food and Drug Administration and Control (NAFDAC)' to combat the spread of fake drugs.[12]

In 1998, the Nigerian government introduced 'Decree No.21', which criminalized the manufacture and sale of counterfeit drugs.[37] However, with inadequate infrastructure and political will, NAFDAC did little to enforce 'Decree No.21'. Officials estimated that, in 2001, counterfeits still accounted for half of the available drugs in Nigeria.[12] It was not until neighboring nations Cameroon and Niger banned imports of Nigeria's drugs because of their poor quality that Nigerian authorities took drastic domestic action.[12] In August 2001, the Nigerian president overhauled the whole management team of NAFDAC and installed Dr. Dora Akunyili as its new director general, with the aim of restructuring the organization to "safeguard the health of the nation".[37] Akunyili's policy changes, combined with increased political will, had the desired effect: fake drug circulation was reported to have dropped by over 80% between 2001 and 2006.[37] Four of NAFDAC's policy changes under Akunyili will now be explored.

Safeguarding imports

The Nigerian pharmaceutical industry has the potential for meeting 75% of the nation's pharmaceutical needs, through its 130 manufacturers.[37] Due to a lack of maintenance and high running costs, only 60 are actively manufacturing domestic drugs, meeting only less than 30% of the country's pharmaceutical needs.[37] Consequently, the majority of the country's medicines had to be imported, with the bulk of these coming from India.[37] The European Commission estimated that Indian exports were responsible for three quarters of the fake drugs in Nigeria.[3] The exporting and importing countries' lax enforcement of their laws at customs' points clearly allowed counterfeit medicines into the supply chain. In 2003, in response to this finding, NAFDAC banned the importation of all drugs apart from those arriving at two ports and two airports so that all measures to check the efficacy of drug imports could be focused in these four areas. In the five years after this policy implementation, Nigerian customs officials destroyed $109 million worth of counterfeit pharmaceuticals.[12] NAFDAC has also be-

gun working more closely with the Indian authorities to prevent the problem at source. India's minister for commerce has said that "Indian pharmaceutical companies are constantly in touch with NAFDAC" and that the Indian government has "institutionalized pre-export inspections" of drugs to Nigeria.[37] On top of this, India has started sending NAFDAC a list of "blacklisted" pharmaceutical companies, to prevent their products from being bought.[37]

Enforcing existing laws

Although 'Decree no. 21' had criminalized the act of making or selling counterfeit pharmaceuticals in Nigeria since 1998, the sentences under this law were lenient.[37] Prior to Akunyili's appointment, the law stipulated that someone convicted under 'Decree no. 21' could not be fined more than 5000 Nigerian Naira ($43), which did little to deter criminals, especially considering the large potential profits to be gained from this illegal trade.[47] In 2002, Akunyili repealed the previous laws on drug counterfeiting and, with the help of the Nigerian government, passed a law that stated that those found guilty of the production or knowing distribution of fake drugs could be fined up to 500,000 Nigerian Naira ($4300) and serve a prison sentence of 5-15 years.[47] Considering that the GDP per capita of Nigeria in 2013 was $2722 the hundred-fold increase in the fine and new prison ruling would seem more likely to discourage counterfeiting.[2] In 2006, NAFDAC secured 45 convictions for drug counterfeiters with another 56 pending trial, which Akunyili claims are more than those charged during the previous decade.[47]

Educating pharmacists:

Drug distribution within Nigeria has been described as "chaotic", with patent medicine stores, community pharmacies, wholesalers and public and private hospitals making up the recognized pharmaceutical vendors.[47] Pharmacists have an integral role in protecting the supply chain from counterfeit drugs because of their presumed expertise in drugs, and they are the last point of contact before the patients in the supply chain. However, before 2001 the only academic requirement for community pharmacists (who sell nearly 50% of Nigeria's pharmaceuticals) was a secondary school leaving-certificate, which did not equip them to spot the fake drugs within their stock.[36] Therefore in 2004, NAFDAC increased the length of training for community pharmacists with a specific focus on identifying fake drugs using visual aids including the size and shape of tablets and the quality of the printing and holograms on the packaging.[37] This is the quickest and cheapest way to detect counterfeits and, if implemented successfully, can reduce the need for expensive chemical analysis by chromatography and spectroscopy.[6] A descriptive study by Odili found that after the policy changes, 100% of community pharmacists in Lagos state undertook a visual examination (including checking embossments, printing and holograms) of new drugs bought from distributors.[48]

Technology

NAFDAC has also used innovative technology to stay one step ahead of counterfeit drug manufacturers. The earliest defense against counterfeits used trademarked branding and distinctive pill designs, but counterfeit manufacturers have quickly adapted their technology to replicate these techniques.[5] Even the use of highly complex holograms can now be copied with such detail that it may be impossible to detect counterfeits with the naked eye, thus making instrumental analysis essential.[4]

In 2007, The Global Pharma Health Fund (a German public-private partnership) invented a mobile device, called the "minilab", to identify counterfeit drugs.[12] The "minilab" uses two visual analyses, visual inspections and a disintegration test, as well as two chemical analyses, colorimetry and chromatography; it has a reported accuracy of 99% in detecting counterfeits.[19] The "minilab" has reagents that are stable in hot temperatures and can be run without electricity, so is particularly valuable in the equatorial climates of SSA.[19] In 2011, NAFDAC purchased 100 "minilabs", costing $6000 each, and distributed them to customs officials, enabling them to analyze drugs entering the country without the need to send them to the NAFDAC laboratory in Lagos.[37]

Limitations

There are several limitations to this paper. The first is that because of the clandestine nature of pharmaceutical counterfeiting, the available research is restricted. Many of the victims of drug counterfeiting never know that they have been exposed and so estimates of the scale of the problem tend to be "shrouded in ignorance and confusion".[6] There is also a dearth of official documents that analyze the prevalence of fake drugs around the world, since only 5-15% of the 191 WHO member-states report cases of pharmaceutical counterfeiting; the remainder is concealed.[6] Secondly, the accumulation of small-scale prevalence studies in SSA (Figure 1) were all compiled using different methodologies, so they are not directly comparable. Only two of these studies used packaging analyses, so substandard drugs could be misclassified as counterfeit drugs. Nevertheless, the comparison study was a valuable tool to highlight the fact that the problem of counterfeit pharmaceuticals is not limited to one or two countries, but represents a problem that is endemic throughout SSA.

Conclusion

This paper has highlighted how the counterfeit pharmaceutical trade is a truly globalized public health problem: fake drugs have a detrimental impact on the health of those who take them, cause a loss of faith in healthcare systems and put the whole population at risk through increased drug resistance. Counterfeit pharmaceuticals widen health inequalities between the richest and poorest nations in the world.

Although the adverse health implications of fake drugs are well documented, the exact scale of the problem in SSA is yet to be established. Due to the discrepancies in national definitions for counterfeit pharmaceuticals, misclassification of substandard drugs and a reliance on the results of studies with poor methodological quality, the figures cited for the global and regional prevalence of counterfeit pharmaceuticals need to be treated with caution. Despite this uncertainty, this paper's collation of small-scale prevalence studies, Nayyar's systematic review and the WHO's cited figure all demonstrate similar rates for counterfeit pharmaceuticals in SSA (39.2%, 35% and 30% respectively). The globalization of the pharmaceutical market, high prices for genuine drugs, a lack of pharmaceutical regulation, chaotic distribution chains, inadequate jurisdiction against counterfeiters and per-

vasive corruption all contribute to the high prevalence of fake drugs in SSA.

There is no simple solution to the problem of counterfeit medicines, as policies have to be implemented at both the national and international levels. Governments within SSA should be encouraged to undertake drug regulatory reforms similar to those in Nigeria, which have reduced the national prevalence of counterfeit drugs by 80% over a five-year period.[37] Nigeria has been at the forefront of establishing policies to eradicate counterfeit pharmaceuticals by improving surveillance at entry points for imports, forging partnerships with exporting countries to reduce counterfeits at its source, increasing the punishments for convicted counterfeiters and reducing corruption within NAFDAC.[47] However, domestic solutions alone cannot solve this transnational problem. Partnerships between importing and exporting countries need to be formed to tackle the problem at all levels of the supply chain. International governance organizations also have a central role to play in eradicating counterfeit pharmaceuticals. The WHO has been successful in harmonizing and coordinating the global community through their definition of counterfeit medicines and the formation of IMPACT. However, because their mandate in public health does not extend to law enforcement, the problem of transnational jurisdiction continues to be a barrier to bringing the criminals involved to justice. The WHO has a duty to use the precedent that it set with the creation of the FCTC to draft and enable a multilateral treaty, which can make pharmaceutical counterfeiting an international crime.

In conclusion, I would like to quote Dr Dora Akunyili, who has waged a successful campaign against fake drugs in Nigeria. In an interview with WHO, she said that having even 1% of drugs counterfeits is "unacceptable, because every life is important".[47]

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Medical student implementation of a Global Health concentration: a unique bottom-up approach

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U.S. medical students are pursuing an education and training in global health at increasing rates. Many medical schools have responded by establishing global health programs offering academic and experiential training to prepare interested students. Implementation of these programs often requires a significant investment of resources from medical schools. At the University of Texas Medical School at Houston, medical students, with support of faculty, addressed the deficit of global health education by creating a university-approved global health concentration. Through a grassroots effort, the students overcame the need for an initial institutional commitment by building partnerships across disciplines and institutions and capitalizing on their enthusiasm for a student directed program This paper highlights the development of the concentration, along with the students' vision for their education in global health. The purpose of this article is two-fold: to demonstrate a student based model for bringing global health education to medical schools without an established program, and to emphasize to medical educators the importance of global health education in the training of future physicians.

Background

Worldwide increases in travel, trade and information flow have reshaped the connections in health and medicine between countries.[1] Physicians are expected to have a broader understanding of infectious diseases, knowledge of the major determinants of health and cultural sensitivity to the increased numbers of international travelers and ethnic minority populations.[2] As such, global health, the multidisciplinary study of the globalization of health determinants and the goal of improving health for all people, has become a growing component of the practice of modern medicine. This precedent of global health involvement holds true for medical students as well.[3] Medical students, now more than before, are able, expected and eager to engage with the health challenges associated with an increasingly globalized 21st century.

Perhaps more than any other single factor in the history of global health, student interest has driven the expansion of this field.[2] Participation in international work has expanded with the availability of commercial travel and financial assistance from major corporations in the 1950s.[1] By 1969, 78% of incoming students and 85% of second year medical students were interested in international work or study abroad.[4] According to a more recent survey conducted by the Association of American Medical Colleges (AAMC), U.S. medical student participation—not just interest—in overseas clinical activities grew from merely 6% in 1984 to nearly 20% in 2003.[5] AAMC data show nearly half of all graduating medical students in 2005 participated in international electives. In a survey of U.S. medical students matriculating in 2011, 65.1% expected to participate in global health education or services during their tenure in medical school.[6]

Medical students are leading the call for a greater emphasis on global health issues to be included in medical education. In response, institutions have created global health programs or centers across the United States.[7-14] About 24% of U.S. medical schools have global health programs, typically in the form of tracks, certificates or concentrations. All programs have didactic and experiential components, but vary widely in the depth of coursework and requirements for research, international travel and language proficiency.[16] However, formal global health training and structured opportunities to go abroad as a part of an organized curriculum are still not available to about 75% of U.S. medical students [3,16-18]. It is common for interested students to seek experiences abroad on their own time or through an international elective, but evidence of these experiences' educational value is weak.[18] Beyond failing to adhere to a comprehensive global health curriculum fostering sustainable, long-term interventions, ad hoc trips do not represent responsible global health practices and can expose the ill-prepared and untrained student to unpredictable risks.

This paper describes how one medical school developed its own global health program from the ground up through a largely student-initiated and -sustained effort. While most programs start with an institutional investment of resources, this program began at the grassroots level with a small, but determined, group of faculty and students. The authors hope that the lessons learned from this experience can motivate medical students to implement global health programs at their medical schools through a similar bottom-up approach.

The Beginnings of Students Improving Global Health in Texas

The creation of Students Improving Global Health in Texas (SIGHT) in 2006 represented the beginnings of a global health focus at the University of Texas Medical School at Houston (UTH). A group of students, working alongside a former dean of the medical school (SGS), established a global health interest group for students to learn about and become involved in sustainable global health projects, both within the borders of Texas and beyond. The organization endeavored to reach this goal through two major avenues: education in the form of a lecture series and service in the form of faculty-led international service-learning trips. A long-term objective was the implementation of a formal global health curriculum at UTH.

Figure 1 Results of a survey of entering medical students at UTH showed a high level of interest in global health education and less background knowledge.

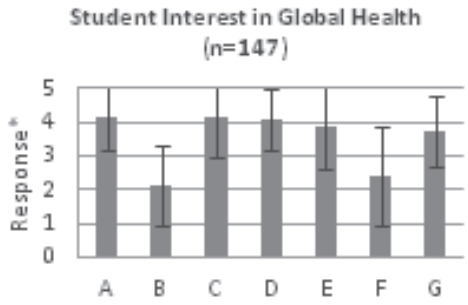
Survey Questions:		Survey Results:
A	Interest in learning about issues in global health	
B	Background in global health	
C	Interest in global health opportunities abroad	
D	Interest in volunteering in local initiatives in Texas	
E	Interest in international rotations during 3rd or 4th year	
F	Do you think increasing student fees to help support the UT Houston global health program is a good idea?	
G	How much does having a global health program at UT Houston matter to you?	

Table 2 Demographics and Trends of the GHC

	2011*	2012	2013
Total Students in GHC†	37	49	47
Acceptance Rate	37/40 (92.5%)	18/19 (94.7%)	17/17 (100%)
Retention Rate	37/37 (100%)	49/55 (100%)	47/53 (89%)
No. Students Graduates	0	4	9
No. Faculty Mentors	11	20	20
No. Publications	0	1	1
No. Posters	0	1	5
No. Partner Sites	4	5	6

* Accepted students in 2011 came from Class of 2012-2014, while students from each subsequent year come from the first year medical student class.
† Total number of students prior to 4th year student graduation
GHC = Global Health Concentration

Table 3 Highlights of GHC's established international partner sites

International Sites	Partner Organizations	Duration of Collaboration (Years)	No. Students Sent Abroad*	Subject Areas Encountered
Roatan, Honduras†	La Clinica Esperanza	7	83	Environmental health, diarrhea, malaria, child and maternal health, malnutrition
Santa Ana, Honduras†	BCM Shoulder to Shoulder	6	61	Water sanitation, infrastructure building, neglected tropical diseases, malnutrition
Santiago de Veraguas, Panama†	Chicho Fabrega Hospital; ANCEC	4	32	Women's health, HPV/cervical cancer, child and maternal health, malnutrition
Brownsville, Texas, USA†	Browne Road Community Center	3	24	Border health, migrant health, health promotion, nutrition, community gardening
Qingdao, China	AHMCQU – Huangdao branch hospital	2	3	Global surgery, gastric cancer, comparative health systems, rural vs. urban health

* Data based on travel from 2007 – 2012
† Available as a 1-week Experiential Trip over Spring Break
GHC = Global Health Concentration; BCM = Baylor College of Medicine; ANCEC = Asociación Nacional Contra el Cáncer; AHMCQU = Affiliated Hospital of Medical College Qingdao University

Service

SIGHT's earliest—and best embraced—accomplishment was the organization of weeklong service trips. In order to fit international travel into the academic schedule of students and faculty, these trips typically take place during students' breaks and aim to provide sustainable, preventative health care to international communities. The first Experiential Trip over Spring Break (ETOSB) was to Roatan, Honduras, and initially involved the construction of a medical clinic to serve the island's population. In response to SIGHT's growing membership and student demand for global opportunities, SIGHT's leadership capitalized on opportunities provided by faculty with personal ties to sites abroad to expand the availability of opportunities. New trips to Santa Ana, Honduras; Santiago de Veraguas, Panama; and Brownsville, Texas, were subsequently added, and students return to the same site every year to provide secondary and tertiary preventative healthcare services under faculty supervision, as well as health education and supplies. Activities have included working with local healthcare providers to conduct basic health and dental screenings, cervical cancer screening, acute care services, nutrition education and building community gardens. Furthermore, an ancillary interest group focused on Texas-Mexico border health, called Frontera de Salud, emerged in 2010. Frontera de Salud offers opportunities for students to become involved in global health domestically through collaboration with local health advocates to strengthen the primary care network in extremely underserved communities.

Today, SIGHT has expanded to include a larger local initiatives component. Students organize local health fairs, engage in public health outreach and participate in clinical preceptorships. The organization now has the capacity to offer students sustainable programs that provide both preventative and acute health care to the local community.

Education

In parallel with service activities, SIGHT's student leadership organized a semester long lecture series to highlight key topics in global health practice and research. The lecture series featured expert talks by faculty and researchers from within the Texas Medical Center and were widely attended by students, residents and faculty. Because of its initial popularity, the Global Health in the 21st Century lecture series is offered annually and includes external speakers from across Texas.

Quantifying Student Interest & Priorities in Global Health

Being primarily an interest group, SIGHT largely operated on offering episodic exposures – through its weeklong experiential trips – to global health without requiring extensive commitment from its members, and likewise without an avenue for longer-term involvement. The student leadership felt that while SIGHT was a strong foray into the world of global health, UTH lacked an organized and purposeful global health curriculum. To better characterize students' interests and needs, first year medical students at UTH were surveyed regarding their interest and educational priorities in global health [Figure 1]. The survey demonstrates that most students start medical school with little background in global health (2.1/5.0), but their interest in obtaining a global health education and gaining experience abroad remains high (4.1/5.0).

The Development of the UTH Global Health Concentration (GHC)

The high level of interest in global health education, combined with the increasing competitiveness of the experiential spring break trips and growing SIGHT membership was evidence that the medical school could benefit from a formalized curriculum to develop the students' global health exposures into a structured educational program. After extensive review of prominent global health programs at U.S. medical schools, the student leaders of SIGHT designed a curriculum that would incorporate existing efforts into a more structured program. The school leadership accepted the curriculum proposal, and the Scholarly Concentration in Global Health (GHC) was approved by the University in March 2010 as one of 11 concentrations at UTH.

However, GHC faced several unique challenges from its inception: 1) the GHC is the only concentration without a departmental affiliation from which to base its activities; 2) UTH does not have global health-specific faculty, and there were no provisions made to officially recognize faculty involved in the GHC; and 3) the concentration did not have dedicated funding or administrative assistance to support its operations and activities. With only a blueprint for a curriculum, the responsibility of implementing the GHC fell to the new Program Director (CSG) and his team of students.

As the GHC was student driven, the student body largely shaped the concentration's requirements and processes. The concentration responded to the major challenges described above by establishing a GHC faculty mentor network, partnering with student organizations and institutions to build capacity, and creating a student leadership team to take charge of implementation duties. The team acted as the central "office" for the new concentration, developing the concentration curriculum by working directly with the medical school administration, the faculty mentors, partner institutions and existing organizations—SIGHT and Frontera de Salud—and with students themselves.

Without the funding to build new educational opportunities, the GHC sought to tap into already existing opportunities, which led to multiple interdisciplinary and cross-institutional collaborations. As a result, GHC students are exposed to diverse perspectives on how global health fits into their role as future physicians.

The Academic Curriculum

Officially launched in January 2011, the GHC's curriculum has both didactic and experiential requirements for medical students to complete over the course of their four years at UTH [Table 1, Figure 2]. These requirements help students obtain a broad base of knowledge in global health topics, while achieving a greater level of competency in their particular area of interest. The goal of the GHC is that at the end of the four years, GHC students who successfully complete the requirements will have learned to critically interpret and analyze global health literature, gained a basic understanding of global health issues and researched one specific topic to be presented as a scholarly project.

The didactic components of the GHC curriculum include the global health lecture series initiated by SIGHT, a public health course offered through the University of Texas School of Public Health, a monthly journal club, and an optional Diploma in Tropical Medicine (DTM) course offered by the National School of Tropical Medicine at Baylor College of Medicine. Students gain a basic foundation of knowledge through lectures that provide both medical and public health perspectives. They are asked to critically engage the subject matter in monthly journal clubs, which are led by students under the guidance of faculty mentors. Most of these requirements take place in the first two classroom-based years of medical school, allowing the student to pursue a topic of interest in depth in the remaining time. Lastly, the option of taking the DTM is a unique opportunity for those particularly interested in tropical medicine.

Experiential learning provides students with a hands-on approach to apply the concepts learned through didactic requirements to both international and domestic environments. Faculty mentors ensure that students are practicing global health in an ethically responsible manner with consideration for sustainability and long-term impact. Prior to travel, all students are required to complete ethics modules and have mentor-approved trip proposals. Students must further submit a post-travel report of their activities. Mentors also work with students to produce a capstone scholarly project. Finally, students present their work at an annual poster symposium prior to graduation.

Structure and Governance

In contrast to other scholarly concentrations at UTH, the GHC has a unique structure in that it is primarily overseen by a leadership team consisting of one program director and six students, who are responsible for the daily operations and implementation of course curricula. The GHC is not housed within a specific department or office. The leadership team works closely with faculty mentors, the Office of Educational Programs and concentration students. This organizational structure has the advantage of flexibility and responsiveness to students' needs, such that the completion of the curriculum is an attainable goal for students despite the rigorous coursework and schedule of medical school. However, the biggest disadvantage to this structure is the rapid turnover of leadership with each new academic year, which leads to a lack of institutional knowledge and wasted time in repeating mistakes. The GHC has addressed this with a tiered leadership approach, where two students represent each class from the second to fourth years. New leaders are recruited during their second year and remain on the team until they graduate.

Achievements to Date

In the three years since its creation, the GHC has sponsored a total of 60 medical students (including current and graduated) and 20 faculty members who volunteer as mentors [Table 2]. The program has an 89% retention rate and 13 graduates that are attending residencies in a multitude of medical specialties across the nation. SIGHT now sponsors four faculty-led overseas trips in Honduras, Panama, and Brownsville, Texas. Scholarly work is another important outcome measure in the GHC, and approximately seven students have published first-authored original manuscripts or presented their work at regional and national conferences.

Currently, two endowments at UTH are earmarked for global health activities, which fund scholarships that support up to two students ($500 each) annually for international travel and global health research projects. While the GHC is unable to financially support most students, the philosophy of the concentration is that global health experiences can occur on a local level as well. Thus, local trips at approved rural sites like Brownsville, Texas, provide an affordable alternative for meeting the experiential requirements, so that cost does not prohibit a student's decision to pursue a global health education.

Despite the addition of new trips to accommodate the increase in student interest, the current demand still exceeds the number of available spots on international trips [Figure 3]. Currently, all the organized trips abroad are short-term, one-week experiences for the pre-clinical medical student. This is due to the rigorous academic schedule for students and faculty, such that longer time commitments would be unfeasible. Nevertheless, these intensive experiences are extremely meaningful for pre-clinical students who work under close supervision of UTH

faculty and local healthcare workers. Many of these students are engaging in international work for the first time, and such experiences have a lasting impact with multiple benefits, as will be discussed later. The community gains a short-term benefit from the provision of services, and SIGHT's annual return maintains its sustainability. Trips of longer duration are typically undertaken by fourth year GHC students returning to a previous international site to conduct studies or provide clinical services. However, the GHC recognizes that individually organized trips can vary significantly in quality and hence continues to forge new partnerships under best practice guidelines in global health training in Guatemala, China, Ghana, India, and Kenya.[20] More distant sites are better suited for more in-depth immersion experiences from a practical point of view. Each site is unique in both the population served and the subject areas addressed, emphasizing the multi-disciplinary nature of global health [Table 3]. With its unique, bottom-up approach and structure, the GHC is able to adapt quickly to students' desires and trends at UTH.

Current Challenges

The GHC faces challenges that may limit its capacity to expand educational programming. Despite the benefits of student control in managing the concentration operations, it is an inefficient process. There are time and resource constraints upon the student leadership given their concurrent academic duties and finite stay at the institution. The administrative demands on the leadership team are extensive and can only be accomplished with extracurricular time. Cross-coverage of responsibilities must be arranged for situations, such as examinations and time-intensive rotations, to prevent lapse of operations. In addition, faculty interested in global health can become mentors for students, but there is currently no compensation for faculty time. All mentors are volunteering their time, thus limiting the GHC's ability to coordinate faculty-led trips with longer durations. Furthermore, the shortage of dedicated funding or administrative support has required the GHC to pursue creative solutions to bring high quality education to medical students. The curriculum is made possible through multidisciplinary and cross-institutional collaborations at every level of the health science center. The GHC partners with many student organizations for events. The leadership team works closely with faculty from various departments to leverage their resources into opportunities for students, such as research projects or faculty/department-sponsored abroad trips. The GHC also collaborates with the University of Texas School of Public Health to bring an established global health course to second year medical students. Many of the challenges encountered in program implementation and development stem from the lack of a centralizing locale (e.g., department, center, or institute) within which the concentration, and all global health activities in general, can exist. Ultimately, a higher level institutional investment in the program would be required to fully address these barriers.

The major drawback of the grassroots approach is that program development operates on a much slower time frame, given the multitude of constraints in time, manpower and resources. The GHC took nearly two years to fully implement all aspects of the original curriculum, and changes are still ongoing.

Impact of Global Health Education on Students

According to a comprehensive literature review, there are multiple positive outcomes of global health education.[20] Three main areas of impact included students' professional development, medical schools and the host populations. Students commonly report a broadened perspective about the world that will enable medical students to apply global thinking, skills acquired in low-resource settings and cross-cultural competency to medical practices at clinics within the U.S. Such experiences encourage students to pursue careers in primary care, which is a beneficial result as a shortage of roughly 20,000 physicians is predicted in the areas of primary care by the year 2020.[21, 22] Moreover, by including a global health curriculum, medical schools make themselves more attractive to high-quality student applicants.[21] The inclusion of global health education affords institutions the opportunity to provide a wider range of clinical experiences to its students. Challenges students encounter while abroad, including different disease prevalence and scarce resources for diagnosis and treatment, introduce new elements to medical education and instill in students a deeper understanding of diseases. According to Novotny et al., "prior experiences and training also likely have effects on ultimate outcomes, suggesting that a longer-term integrated learning program" may be imperative to optimize outcomes of shorter-term experiential learning.[1] This finding supports a fully integrated global health curriculum that the GHC strives to become and aligns with the educational priorities of UTH medical students. Finally, cross-cultural trips can positively impact host populations when the partnership is sustained and the local community's needs are addressed.

Concluding Remarks: An Argument for the Expansion of Global Health Education

Student-initiated development of a global health program is rare, but one other recent example of a successful student-led effort was at Weill Cornell Medical College.[14] Similar to UTH's GHC, the program was preceded by multiple established partnerships and lecture series; however, their program drew support and resources from pre-established global health programs and faculty from other departments, as well as a full time global health fellow. In contrast, the UTH's GHC student leadership oversaw all educational programming, established its own inter-institutional faculty base, assumed all administrative and operational duties, and engaged in capacity-building across institutions and countries. In addition, all operations were budget neutral.. Hence, the GHC remains truly unique in the extent of its grassroots efforts on which other student-led initiatives could be based.

Taken together, there are several arguments for the expansion of global health education in medical schools, as well as the continued development of the GHC.

1. An Integrated Learning Experience – A curriculum in global health can better prepare U.S. medical students to care for the growing international population in their communities. GHC students can now draw upon the knowledge gained from their lecture series, journal clubs, and abroad experiences to serve local residents at the front lines of global health.
2. a Platform for Sustainability – Providing a portal for students to learn at established international sites fosters sustainable global health care. The GHC continues to develop partnerships with hospitals and non-profit organizations, while maintaining strong collaboration with our current partners abroad. These relationships will create a network of opportunities upon which UTH students can capitalize.
3. Institutional Oversight – Given the demand for global health experiences, the risk of sending unprepared medical students abroad is great. This lack of training not only presents a personal risk to students, but may also result in substandard clinical performance of traveling students.[18,20] Because of GHC's mentoring system and utilization of resources from multiple disciplines, the GHC can ensure that UTH students are properly prepared.

The GHC can be a vehicle to global health education success at UTH. As Panosian and Coates ask, "If there is new fervor for global health on the part of medical professionals and international policymakers, shouldn't the 'sending' process be more organized — and the vision bigger and bolder?"[5] With a vision and dedicated group of students and faculty, a grassroots approach to building a successful global health concentration is possible. This approach demands patience, creativity, and the understanding that real change takes time. Implementation will be step-wise, often requiring multiple revisions in response to specific or new challenges and resources available. Outcomes need to focus on adding value to the students' education. In conclusion, the authors believe that the GHC can fulfill this role in fostering students' thirst for quality global health education and hope to offer a blueprint for how a program can be developed through a bottom-up grassroots strategy.

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References available at **JGH Online, www.ghjournal.org**

Building a successful Global Health curriculum: advice from a fellow trainee

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Global health is an interprofessional collaboration to improve population health and individual clinical care worldwide. As interest in global health increases and educational programs respond to this growing interest, there is a need to re-evaluate the strength of rapidly growing global health training programs. As many other education systems move to competency-based training, so too should global health. Competency-based training focuses on the ability to perform a task, understand a concept or approach a problem with the appropriate attitude successfully.[1–3] Much of the old model of global health education is content-based and emphasizes number of training hours completed. The Association of Schools and Programs of Public Health (ASPPH), the leaders of the competency-based educational effort, believes that global health education should be outcome-oriented.[1] Outcome-based global health education will ensure that trainees are better equipped with the knowledge, skills and attitudes needed to enter the global health arena. Goals of global health programs should include competency-based curricula implementation and an emphasis on core competencies that span all disciplines related to global health. Developing these cross-disciplinary global health competencies has been an ongoing project of the Consortium of Universities for Global Health's (CUGH) Global Health Competency Subcommittee for the past year. The Subcommittee members have collaborated and developed core competencies for two trainee levels of global health involvement. From this experience of competency development comes the inspiration for a trainee-led movement for the successful implementation of these competency sets. Trainee-driven global health curricula will encourage programs to shift their standards from hours invested to skills, knowledge and attitudes acquired. If done across all global health disciplines, this will ensure that all professions have the competencies needed to work together on achieving the collective goals of global health.

The Collective Goals of Global Health Programs

The global health literature contains many definitions for the term "global health." Some consider it the most recent version of similar terms: international health and tropical medicine.[2] This view sees the renaming with a new term "global health" as a way to mask a lack of change. Renaming international health or tropical medicine programs to "global health programs" masks the fact that developed countries continue to apply wasteful, Western methods in addressing the public health problems of developing nations. Others find the new term represents true change by emphasizing collaboration between the Global North and the Global South As explained by Ouma and Dimaras in their debate article on global health program partnerships, the terms/concepts of "Global North" and "Global South" do not refer to a geographical dichotomy, but a broader "socio-economic divide" that exists both between and within countries.[25] As Dr. Peter Piot, Director of the London School of Hygiene and Tropical Medicine, said during his presentation at the 2014 Consortium of Universities for Global Health (CUGH) conference, this reframing of global health provides an opportunity for novel approaches to public health issues.[26] The explanation by Ilona Kickbusch, Director of the Global Health Programme at the Geneva Graduate Institute, emphasizes that within global health all contributors to the field need to share the risk and feel the consequences when programs perform poorly:

> The term Global Health stands for a new context, a new awareness and a new strategic approach in matters of international health. Its focus is the impact of global interdependence on the determinants of health, the transfer of health risks and the policy response of countries, international organizations, and the many other actors in the global health arena. Its goal is the equitable access to health in all regions of the globe.[27]

This global health consists of many disciplines relying on one another to collectively improve population health and individual clinical care. The next generation of physicians, public health workers, engineers, nurses, anthropologists, mental health professionals and others must be trained to a defined level of competency in order to cooperate effectively. While many competency-based skills are discipline-specific, knowledge and attitudes can more easily be instilled with a cross-disciplinary approach. To address many of the global health goals, multiple disciplines will need to speak the same global health language (knowledge) and understand their own personal and discipline-specific limitations (attitudes).

CUGH's mission is to "[build] interdisciplinary collaborations and [facilitate] the sharing of knowledge to address global health challenges." In keeping with this mission, it has an Educational Programs Committee and a Global Health Competencies Subcommittee. As a member of both, I offer a trainee's perspective on how to improve global health competency-based education. We recently outlined sets of cross-disciplinary core competencies for global health curricula. The members of the Global Health Competencies

Subcommittee chose the global health definition proposed by Dr. Jeffrey Koplan, Vice President for Global Health at Emory University and former Director of the CDC. According to Koplan et al., global health refers to:

> [A]n area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. Global health emphasizes transnational health issues, determinants, and solutions; involves many disciplines within and beyond the health sciences and promotes interdisciplinary collaboration; and is a synthesis of population-based prevention with individual-level clinical care.[8]

Koplan et al. emphasize the importance of improved public health and increased access to individualized medical care as broad, collective goals of global health programs worldwide and again highlight the importance of collaboration. While many broad definitions of global health exist, the few that emphasize a cross-disciplinary, collaborative approach to health offer the most success for achieving the overarching goal of improved health globally. These definitions encourage both teachers and trainees, the Global North and the Global South, to work together for improved global health education and, in turn, improved health worldwide.

Competency-Based Education

To work together effectively to improve health globally, trainees first need to achieve competency within this growing field. Competency is defined as "the ability to do something well,"1and thus, competency-based education focuses on the instruction necessary to acquire select abilities. Competency-based education is the teaching and assessment of knowledge, attitudes and skills trainees need to succeed within their fields.[7,8] The Association of Schools and Programs of Public Health (ASPPH) has pioneered the majority of the work thus far in competency-based education. As ASPPH highlights, the competency-based model differs from previous training programs in its outcome-based orientation as opposed to an emphasis on training hours and content.[1] Competencies are the foundation upon which all curricula and training programs should be built. They give trainees obtainable stepwise goals to strive for and provide long-term career-development benefits worldwide. For instance, a recent study from Chang Gung University of Science and Technology in Taiwan demonstrated that nursing students who completed competency-based training during nursing school not only performed better academically on written standardized exams and structured clinical exams, but also had higher rates of employment following completion of their training programs compared to students who completed the former standard curriculum.[1]

To work together effectively to improve health globally, trainees first need to achieve competency within this growing field.

Bok et al. recently surveyed 1,137 veterinarians across ten countries regarding the importance of competency-based veterinarian training. The majority of the veterinarians surveyed agreed that competency training is very important: the specific competencies associated with "veterinary expertise" in the survey scored a combined 8.33 on the 9-point Likert scale. The idea that competency-based education is effective for training programs is not a novel one within medicine, as competency-based education has been the foundation of graduate medical education curriculum redesign for over a decade. The Accreditation Council for Graduate Medical Education (ACGME) began its third phase of the national curriculum redesign in 2011, mandating medical residency programs to improve and change their curricula based on the residents' performance upon reaching the six core competencies physicians need to be effective upon graduation.

How Trainees can Improve Current Global Health Programs

The interest in global health careers and training programs and the response to said interest is booming. Approximately 65% of matriculating U.S. medical students were interested in "Global Health education or service" in 2011.[9] Academic institutions and professional societies continue to develop stand-alone global health degree programs and incorporate global health topics into professional school curricula.

There are various reasons why students are interested in global health careers. Some indicate that they would like to participate in cross-cultural experiences and learn how to care for diverse populations prior to entering their professional practice. Many trainees find value in the field experiences provided by global health programs and draw motivation from seeing health disparities in person. Field experiences motivated many to hypothesize solutions for how to improve health equity. Yet, trainees interested in careers in global health have shared training concerns with me. Reading global health-related books, writing research papers and taking the current global health courses are not enough. Many of us have realized that it is very easy to make mistakes during field projects and are concerned that we will continue to make such mistakes in our full-time global health careers without the proper skill sets. This can lead to an ongoing fear that we may do more harm than good in the pursuit of a global health career. Many students at Geisel SOM and within CUGH are continuing to look for more skill-based training opportunities within global health programs for these reasons.

Recently, the CUGH Competency Subcommittee members did a web search for global health training programs syllabi and existing global health competencies and found that no two global health degrees, concentrations, certificates etc. appear to require the same competencies to be achieved. This presents a problem when trainees explore careers within global health. How can a group of individuals with vastly different competency sets be expected to begin working towards the collective global health goals and all be successful in their approach? As Holmes, Zayas and Koyfman from University of Buffalo SOM explain via their medical student pre and post global health experience surveys, there is a need for trainee, self-identified learning objectives to drive improvement of global health field experiences.

My fellow trainees at Geisel SOM at Dartmouth and I hope for competency-based training that is consistent across training institutions and oriented towards real world applications. For future improvement, if the training programs are built on foundations of attainable competencies, they can offer discipline-specific goals for trainees. For example, for the medical resident: be able to assess and manage the obstetrical emergencies of eclampsia, post-partum hemorrhage, perinatal infection and endometritis in a resource-limited setting. For the law student or health policy graduate student: be able to advocate for implementation of policies that protect the Universal Declaration of Human Rights; be able to defend populations' right to affordable and safe health care via individual patient defense cases and population-based healthcare resource distribution policies. For the engineer: be able to develop water purification systems or composting latrines using limited resources and then reverse engineer this energy-efficient method for implementation in a resource-wasteful culture.

While competencies are generally useful for helping trainees understand what is required of them, some faculty in academia have noted that competency-based education does not equate to standardized education. Whitehead, Austin and Hodges, faculty in the Department of Family and Community Medicine in Toronto, argue that "No matter how elegant, no matter how useful, no matter how widely-adopted, any competency framework will be infused with assumptions and embedded in power relations."18 These "power relations" can affect the dialogue around current pro-

fessional competency development as they did for the Canadian competency framework, developed as the authors argue to "protect [the] professional turf" of attending physicians. However, as a trainee, I feel trainees can initiate change to this system of competency framework implementation for "economic and socio-political use." Such power relations often exist within academic institutions and within global health program collaborations between the Global North and Global South with professors, program directors and teachers from the Global North setting the agenda. These power relations can be dissolved and competency frameworks can set training standards when trainees are invited to sit in the forums where the competency frameworks are being developed. Trainee input promotes implementation of competencies that are relevant and attainable, preventing the potential problems that arise when academic administrations, far removed from the classroom, are left to develop core curricula.

Proposed Cross-Disciplinary Core Competencies

Many disciplines besides medicine are involved in global health work including engineering, anthropology, nursing, psychology and pharmacy. Thus, to improve global health competency, we must adopt cross-disciplinary competencies acceptable to both trainees and instructors from a range of professions.

In response to this need for cross-disciplinary, competency-based learning within global health curricula, the CUGH Education Committee appointed a Global Health Competency Subcommittee. Our cross-disciplinary Subcommittee members were to "[determine] if there exists a need for broad global health core competencies applicable across disciplines, and if so, what those competencies should be." Based on this directive, our Subcommittee set out to develop core competencies applicable across disciplines. The final list of competency sets, stratified for multiple trainee level needs, will be available in 2015 in The Global Health Competency Subcommittee's manuscript Identifying Interprofessional Global Health Competencies for 21st Century Health Professionals.

As the trainee voice on the CUGH Educational Committee and Global Health Education Competencies Subcommittee, I worked alongside members from diverse disciplines to develop the proposed core competencies. We did an extensive review of the literature and searched professional societies and webpages to see what global health-related competencies already existed. We compiled and distilled an initial list of 82 competencies across 12 domains.

We then defined four levels of global health training: Global Citizen Level; Exploratory Level; Basic Operational Level, subdivided into Practitioner-Oriented and Program-Oriented; and Advanced Level. Global Citizen Level includes all trainees pursuing post-secondary education. Exploratory Level includes trainees interested in either in-person field exploration or classroom-based exploration of how culture, socioeconomic stratification, resource availability and historical factors impact health globally. The Basic Operational Level is competency required of trainees wishing to spend a moderate amount of time, but not necessarily a career, in global health. The Practitioner-Oriented subset requires competence in applying discipline-specific skills to offer solutions for global health problems. The Program-Oriented subset requires competency in the ability to coordinate, plan, implement and evaluate global health programs. The Advanced Level is aimed at students whose involvement in global health will be significant and sustained, and thus will benefit from more discipline-specific competencies than the Subcommittee's cross-disciplinary ones.

After further distillation of the competencies, the final list included 13 competencies across eight domains assigned to the Global Citizen Level and 39 competencies across 11 domains assigned to the Basic Operational Program-Oriented Level. These competency sets will be important for building strong cross-disciplinary global health education programs necessary to improve trainee preparedness. For instance, the competencies will help prepare all disciplines contributing to global health solutions by making sure all trainees know how to contribute to Capacity Strengthening (Domain 4). The competencies will ensure trainees from all disciplines are instructed to "look for methods to assure program sustainability." If implemented, the competency sets will require trainees to be evaluated on their ability to "demonstrate diplomacy and build trust with community partners," which falls under the overarching category of Collaboration, Partnering, and Communication (Domain 5) More importantly, trainees will increase collaboration and look to other disciplines to help develop solutions because of the emphasis on the competency of "acknowledging one's limitations in skills, knowledge, and abilities."[21]

While these and the rest of the 39 competencies are very important for improving trainee preparedness, this project has shown that we have a long way to go within competency-based global health curricular redesign. If evaluation protocols are not put into place and further investment from developing country institutions is not considered, these competencies will exist merely on paper and perhaps be partially implemented by some global health programs, but there will not be the broad adoption of the proposed competencies by programs worldwide, nor the assurance that trainees are acquiring the skills, knowledge and attitudes proposed, to come closer to reaching the goals of global health.

Future Directions

There is a need to implement the proposed core global health competencies. More importantly, there is a need for improved methods of assessment of these competencies. Throughout the development of these competencies sets, the Subcommittee benefited from various professionals providing input. However, for global health to truly become collaborative there is a need for more input. This input should come from institutions and global health programs in the Global South. Not actively involving developing countries, where many of the effects of global health programs are felt, is negatively impacting the global health education conversations on competency set development. As Ouma and Dimaras explain, much of the current global health education efforts focus on the improvement of student gain from experiential learning

with little focus on the benefit of the host partner institution and its students. This is highlighted by the Global North perspective article by Holmes, Zayas and Koyfman, which encourages the implementation of learning objectives by faculty and medical students to improve the students' "learning experiences in global health elective[s]," but does not mention how to improve the experience of the partner institutions or communities.

The need for specific cross-disciplinary core competencies to guide global health training is evident.

If global health training programs were more similar to medicine, nursing, engineering or business, where there is a standardized exam at the end of the training, there would be more accountability for the instruction trainees receive. Training programs would also be strengthened if institutions in both the Global North and Global South were invited to write the exam questions and set up the global health hypothetical simulations for the standardized exams. If instructors from both the Global South and the Global North had to assess the results of these exams and simulations for the global health degree-conferring process, global health training would change drastically for the better. Global health training would finally become a true collaboration between instructors and trainees and the Global North and South to produce a generation of competent professionals ready to address the health needs around the world. It would no longer consist of unilateral training programs created by administrators at institutions within the Global North directed at training students to work in the Global South.

While the implementation of competency-based global health education would require many hours worth of meetings on curricular and program reform, the potential hiring of new faculty at academic global health programs to shift from lecture-based to smaller group skill-based learning and a need for current global health programs to pause field projects, the benefits outweigh the risks. In the 2013 fiscal year, the United States government alone spent $8.4 billion on global health programs and The Bill and Melinda Gates Foundation spent over $890 million on their global health program. This does not include the countless dollars spent collectively by other NGOs and academic institutions on global health field projects and collaborations. While this would require a large investment from many academic faculty and administrators and non-academic global health NGO programs worldwide, continuing to invest considerable dollars in global health programs each year without the assurance that we are training future global health investors effectively is not sustainable. This collaborative global health education reform would require the same international team leadership model for rollout as the Gates Foundation committees or PEPFAR or CUGH, and thus is doable if many global health players are willing to take up the cause.

With increased student interest in global health and a push towards interprofessional collaborations, the need for specific cross-disciplinary core competencies to guide global health training is evident. Trainees need to encourage the implementation of competency-based global health education throughout our various disciplines. Since the effectiveness of global health programs and interventions relies on the preparedness of many health and non-health professionals, identification and implementation of a cross-disciplinary framework is essential. Cross-disciplinary sets of competencies should be developed with input from both the Global North and Global South. This new global health educational framework can give trainees concrete goals to achieve and a sense of equal-preparedness worldwide before we start our careers in global health

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Community reintegration of patients with neurological disorders post discharge from the Kachere Rehabilitation Centre, Malawi

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This study investigated the community reintegration status of patients with neurological disorders discharged from the Kachere Rehabilitation Centre (Kachere) in Malawi. The purpose of this study was to determine patient-perceived disability based on specific tasks in the activity and participation dimensions of the International Classification of Function (ICF). The limited studies that focused on patients in countries with few resources have indicated that a number of problems interfered with their return to prior functional status, particularly problems of reintegrating into their home and community environments.[1, 2, 3, 4, 5] With a mixed-method design, the researchers conducted interviews with patients poststroke (CVA) and various other neurological disorders (N-CVA). They quantified patient self-reports of disability using the World Health Organization's Disability Assessment Schedule 2.0 (DAS). A researcher-designed Home Observation Data Form (HOD) provided descriptive environmental information. Analysis of DAS data supported the research hypothesis that patients perceived moderate to severe levels of disability. These findings did not correlate with diagnosis or gender. Environmental barriers such as narrow passageways within, surrounding, and leading to the homes; rough and hilly terrain; water sources outside the home; lack of cars; and long distances to markets and places of worship appeared to play a significant role in limiting home and community participation activities. This study's results documented patient status, verified literature for similar patients in countries with few resources, provided programming considerations for Kachere staff with future patients and supported potential use of the DAS for similar research. Potential implications reach beyond immediate patient needs based on the WHO World Report on Disability.[6]

Introduction

The rehabilitation program at the Kachere Rehabilitation Centre (Kachere) is the only one of its kind in Malawi, a southeastern African country of 16 million people. Kachere, a 40-bed public hospital, mainly admits adults needing intense rehabilitation services for neurological disorders. Prevailing patient diagnoses include stroke (due mostly to uncontrolled hypertension) and spinal cord insults (due to trauma, infection and tumors). Kachere's services are comprised primarily of physiotherapy, but also include occupational therapy, medical treatment and nursing care.

The focus of Kachere's physiotherapists and rehabilitation technicians is restoring bodily movements and functions -after disease or injury.[7] Based on patient diagnosis, functional recovery is variable. Treatment sessions helping patients to relearn old skills and learn new ones are intense and lengthy. This is similar to rehabilitation programs in well-resourced countries. In Malawi, family members (known as guardians), take up residence at the bedside at Kachere and actively participate in their loved ones' care.[8] Guardians provide ongoing emotional support and physical assistance when needed during physiotherapy.

Following discharge from Kachere, patients return to their prior home environments with variable, (frequently limited,) sets of abilities. At times, they suffer from physical limitations that interfere with participation in the workplace, the home and the community. Hilly and uneven terrain, narrow passageways within ofand outside their homes and outdoor sources of water and toilets become major challenges for patients needing wheelchairs, canes, crutches, or walkers. Public transportation is difficult to use because of distance and inconsistent availability. The challenges faced by these patients are aggravated when they also suffer from additional cognitive and/or emotional difficulties. Depression is relatively common in individuals who have undergone a significant change in neurological status. Studies show that an estimated 33% of individuals post stroke experience depression.[9]

Rehabilitation providers give suggestions to patients for meeting home and community needs during various therapy sessions that focus on mitigating physical impairments.[6] Specifically, they promote daily self-care as well as household and mobility activities,

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Table 1 Patient inclusion/exclusion criteria

More than 30 days since discharge from Kachere
Diagnosis of a neurological dysfunction at time of discharge
Over the age of 21
Able to understand and verbally respond to the qualified interviewer/translator's questions
Live within one-hour travel time from Kachere.
Not pregnant or suspect pregnancy

while fostering a sense of safety, independence, security and confidence. They offer suggestions for easier access around the home, such as widening doorways and installing ramps, or addressing safety hazards by removing obstacles and rearranging furniture. Therapists typically customize their teaching strategies based on individual patient skill levels and goals.

According to WHO, people with disabilities tend to have poorer health outcomes, less education, less economic participation and higher rates of poverty than those without disabilities. [6] Such is the case in Malawi, where backyard farming is the prime source of subsistence and annual earnings average less than 321 US dollars/year. Life expectancy in Malawi is 54.8 years, with communicable diseases beingas the leading cause of death. The percentage of literate adults is 61.3%, but only a limited number (10.4%) attended school beyond the primary years. [10]

Published literature is sparseon the topic of post-rehabilitation community reintegration in countries with few resources is sparse. One small-sample Malawi study interviewed eight Kachere patients with stroke to identify environmental reintegration barriers.[1] The literature from other countries describes a wide range of difficulties that patients experienced in prior social and vocational roles after rehabilitation discharge. Overall, difficulty walking, carrying out household chores, driving and managing finances were associated with lower satisfaction with community reintegration status and dependence on others for survival in their community.[1,3,4,5] Personal and environmental factors were the main barriers to reintegration and limitations to participation. Barriers to reintegration included resuming household responsibilities, shopping, earning a living and joining in community activities.2

Like other rehabilitation program leaders in countries with few resources, Kachere leaders felt their program focused more on patient impairments, with limited and perhaps insufficient attention to home and community participation (Figure 1). [6,11] These observations mirrored those of authors who stated that inpatient rehabilitation goals, in general, lacked a whole-person, patient-centered approach.[2]

With limited government and other outside funding resources, providing necessary rehabilitation services in this populous country poses a challenge to even the most creative of clinicians.[6] In addition, there is little-to-no follow up provided to patients following discharge from Kachere. Both at the clinic and within the local districts, there are limited outpatient rehabilitation services that can provide support and determine patient adaptation to home and community environments. New and pertinent information on reintegration status with examples of environmental barriers could provide valuable feedback for the Kachere patient discharge planning process and helpful information to government agencies for rehabilitation program funding considerations. The ultimate goal expressed by Kachere leaders was to facilitate more meaningful patient life outcomes. Building on that goal and relevant literature, this study provided reintegration status data for a small sample of Kachere patients post discharge. The study aims were to: 1) describe patient-perceived disability as a measure of community reintegration status, 2) explore whether patient-perceived disability varied by diagnosis or gender and 3) describe possible environmental barriers to reintegration.

Methods

Participants

Using consecutive sampling, the researchers identified a population of 35 patients who met the inclusion/exclusion criteria from the Kachere discharged patient files (Table 1). [12] These criteria were

Figure 1 International Classification of Function (ICF) Model

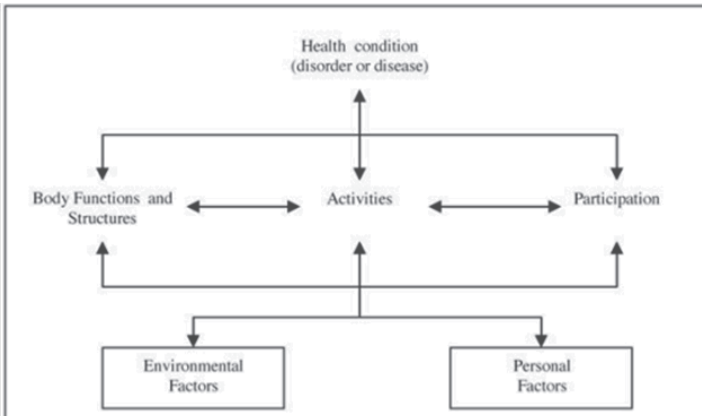

Table 2 DAS key questions with scoring key

Item	During the past 30 days, how much difficulty did you have in:
S 1	Standing for long periods such as for 30 minutes
S 2	Taking care of your household responsibilities?
S 3	Learning a new task, for example, getting to a new place?
S 4	How much of a problem in joining in community activities?
S 5	How much have you been emotionally affected by your health problems?
S 6	Concentrating on doing something for 10 minutes?
S 7	Walking a long distance, such as one kilometer?
S 8	Washing your whole body?
S 9	Getting dressed?
S 10	Dealing with people you do not know?
S 11	Maintaining friendship?
S 12	Your day-to-day work/school work?

Scoring Key:
1=None 2=Mild 3=Moderate 4= Severe 5=Extreme

Table 3 Demographic sample characteristics from DAS input with number and percentage of clients

Descriptor	Sample size	Number of clients	Percentage of clients
Age (mean)	28		
All		51.6	100
CVA		38.7±11.9	53.5
N-CVA		62.7 ±11.8	46.4
Gender	28		
Female		12	42.8
Male		16	57.1
Years of education	27		
0-5		5	17.8
6-9		10	37.0
10-19		12	44.4
Employment status	28		
Paid work		1	3.5
Self-employed			
Non-paid work			
Keeping house/homemaker		2	7.1
Retired			
Student			
Farmer			
Unemployed (health reasons)		22	78.5
Unemployed (other reasons)		3	19.7
Other			

formed based on the WHO DAS 2.0 guidelines, the Institutional Review Board protocols on the protection of human subjects and travel logistics for realistic patient access.

Design

This descriptive cross-sectional study used a quantitative approach to determine patient perception of disability based on home and community activity and participation, with additional descriptors of the pertinent environment. According to WHO, "activity is the execution of a task or action by an individual. Participation is involvement in a life situation,"[13] both noted in the ICF dimensions. The research study hypotheses were as follows: 1) patients perceived moderate to severe levels of disability post discharge from Kachere that significantly hampered community reintegration; and 2) there was a relationship between patient-perceived levels of disability and gender or diagnosis. For example, perceived level of disability could be higher for females who might have more difficulty managing daily household responsibilities than males.[1] Perceived disability could also be higher for wheelchair-bound clients with spinal cord injury than those with stroke. [3]

Because the research was conducted in a resource-limited country, the researchers were sensitive to ethical considerations and standards. Trained native translators were employed to obtain patient consent for participation. Only adult participants who were not considered part of a "vulnerable" population were selected for the study. The researchers undertook this study as a sustainability project in collaboration with the Kachere leadership team, and plan to extend the project's implementation beyond the data collection and analysis phases. The researchers ensured that the federal, institutional and ethical protection of human subjects per the Institutional Review Board (IRB) processes in the US and the Malawi College of Medicine Research and Ethics Committee (COMREC) in Blantyre, Malawi.

This descriptive cross-sectional study used a quantitative approach to determine patient perception of disability based on home and community activity and participation.

Instrumentation

The researchers conducted patient interviews using the 12-item interviewer-administered World Health Organization's Disability Assessment Schedule 2.0 (DAS) to determine patients' self-perceptions of their disabilities. The DAS is a universally accepted, patient perception of disability tool based on established reliability and validity standards. It was developed by the WHO and is grounded in the ICF framework. It quickly measures constructs similar to those in the SF 36 Short Health Survey (SHS), a generic patient-reported survey of health.[16] Uniquely, the DAS also measures day-to-day functioning across a range of activity domains and distinguishes symptoms, disability and subjective appraisal.[14, 15]

The DAS contains a preliminary section with general living location, gender, age, education level and marital and work status. There are 12 key questions relating to patient difficulty completing daily tasks (Table 2). These questions use a Likert-type rating scale, from 1 to 5, with 1=None, 2=Mild, 3=Moderate, 4=Severe, 5=Extreme or cannot do. Key question summary scores (totals) range from 12 to 60, with 12 being the least perception of disability and 60 being the highest. The DAS uses the following patient definitions of difficulty performing an activity: increased effort, discomfort or pain, slowness and changes in the way an individual performs an activity. The interview includes three additional questions about the number of days out of the last 30 in which patients experienced difficulty completing activity and participation tasks.

The researchers developed a Home Observation Data (HOD) form to describe the patient's environment, based on the Malawi - 2010 Demographic and Health Survey (MDHS) and the DAS questions. It contains descriptors for types of dwelling, floor and wall materials, water and toileting facilities, living arrangements and distances to the main road, toilet facilities, markets and places of worship. These descriptors and details helped to identify possible environmental barriers to accessibility. The researchers verified the face validity of the HOD form since it provided the specific information of interest about the home environment.

Data collection, analysis and interpretation

Using Kachere's discharge records, the researchers verified patient diagnostic information. Admission and discharge dates were used to calculate rehabilitation length of stay (LOS). The WinSTAT™ Statistics Add-In for Microsoft™ Excel (version 2009.1) and simple Excel calculations were used to analyze key data. Descriptive statistics included summary scores, means, ranges, median and percentages. Due to the small sample size and ordinal data, the Mann-Whitney U-Test, a nonparametric procedure, was used to determine relationships between summary scores, diagnosis and gender, with a typical statistical significance level set a priori at ≤0.05 (p).

Results

Thirty-one patients met the screening inclusion/exclusion criteria. However, during the initial in-person interview session, the researchers decided to exclude two patients due to suspected cognitive limitations (not apparent from prior contacts) and age limitations discovered while updating information during the initial in-person encounter. Complete DAS key question data were then available for 28 patients, 12 female and 16 male. There was incomplete demographic data for one patient's education level and another one for LOS. Fifteen patients had experienced non-hemorrhagic cerebrovascular accident (CVA) (53.5%) and 13 had experienced some other neurological event (N-CVA) (46.4%) due to complete or incomplete spinal cord paralysis (from trauma, infection and spinal tumors), Guillain-Barré Syndrome or basal ganglia tumor.

Based on the DAS preliminary section, patients ranged from 21-89 years of age, with a mean of 51.6. The CVA group was significantly older than the N-CVA group (Table 3). Years of education ranged from 0-19 years, with a mean of 8.8. A significant number of patients (78.5%) were unemployed or unable to attend school for "health reasons" (DAS terminology). Prior patient occupations included farmer, student, laborer, entrepreneur, government worker and teacher. LOS ranged from 13-164 days, with a mean of 56.2. For patients with CVA, LOS was 49.6 and for N-CVA, LOS was 63.3.

Patient summary scores ranged from 12-53, with a mean of 31.9 and median of 32.5 (Figure 1). Seventeen of 28 scores (60.7%) fell within the ranges from 30-60. Key questions showing the most reintegration difficulty in descending order were: taking care of household responsibilities, day-to-day work or school, joining in community activities and walking one kilometer. The Mann-Whitney U-Test showed no significant relationships between patient summary scores and diagnosis or gender; that is, under the constraints of this study, diagnosis and gender appeared to have no influence on perceived disabilities (Table 4).

The HOD quantitative data providedwas helpful for understanding the patient home and community environment (Table 5). All homes were constructed using permanent housing materials. Most had cement floors and brick walls covered with plaster. Most patients (67.8%) used water piped into the home or communal water sources and 67.8% had toilets outside of the primary residence. Most of the patients (67.8%) required physical assistance for various self-care and home activities.

Discussion

This small-sample study verified the hypothesis that post-discharge, many Malawi patients of Kachere (60.7%) had moderate to severe levels of disability that significantly hampered community reintegration into their home and community settings. The difficulties were in several key ICF dimensions of activity and participation. However, there were no relationships between the perceived levels of disability and specific diagnosis or gender. Environmental barriers within homes and surroundings appeared to play a major role in the degree of successful home and community reintegration. A majority of patients (67.8%) had to use toilet facilities outside of the primary residence, often crossing narrow, uneven terrain in order to access these facilities. For some patients, this situation was compounded by the need to use mobility devices. Public transportation and community activities were frequently located beyond a reasonable distance from the homes and therefore proved inconvenient or too challenging to use. A large number of patients (78.5%) stated that their unemployed status was due to "health reasons." For some patients, physical impairments limited return to prior employment such as running a business or completing household responsibilities. One patient indicated his government position was no longer available to him following a stroke, although he felt mentally and physically capable of performing it.

While this study led to similar conclusions as reported by other authors for patients in countries with few resources, it did not consider the effect of motor function or use of mobility devices on community reintegration.[1,3,4,5] Both Obembe et al. and Hamzat, Olaleye and Akinwumi showed a positive relationship between functional ability or motor function and reintegration in patients with stroke.[4,5] For patients with spinal cord injury (SCI) using mobility devices, Scovil, Ranabhat, Craighead and Wee reported greater difficulties with community participation. All of these factors could have affected the current study's results.[3]

Limitations of this observational study included the small sample size and selection convenience. There was patient subjectivity in perception of disability due to misinterpretation or questionable understanding of DAS information and/or instructions. This misinterpretation could be due to educational background, current cognitive status and overall prior experiences. The researchers accepted patient bias based on the nature of the DAS. Study limitations restricted population generalizability of the results beyond the focus of this study.

This study documented this patient sample's post-discharge status at one point in time (1-24 months since discharge). This could have affected the study's results depending on the specific length of time from the initial neurological event to the time of participation in the study. It verified the literature describing similar patients in countries with few resources, supported potential use of the DAS for similar research applications and provided programming considerations for Kachere staff with future patients.

Potential implications for the staff at Kachere include enhancing training approaches for patients and guardians with a broader analysis of patient discharge requirements in relation to the specific community environment. For example, staff could be trained to determine whether there is a need for alternative living arrangements or whether reasonable modifications to the existing home setting can be made to ease patient reintegration. When appropriate, home visits with patient and staff pre- and post-discharge and/or caregiver-provided diagrammatic/descriptive information could enhance this type of data collection. The HOD used in this research study could provide guidance on content for gathering relevant home visit data. From a training perspective, guardians could be educated to provide decreasing amounts of patient assistance to promote participation in daily activities. By deemphasizing a "do-it-all approach," patients would focus on improving weaker skills and perhaps obtain a greater sense of accomplishment and confidence.

This study is important from a research perspective and adds to the limited literature on the topic of patients in countries with fewer resources and specifically for patients in Malawi. This evidence-based approach could help support future expansion of rehabilitation services in countries with limited resources. Information gained from this study could also help to improve the Kachere discharge planning process and address pressing environmental barriers. Following the example of the WHO World Report on Disability, the results could help to create "enabling environments, develop rehabilitation and support services…to the benefit of people with disabilities and the wider community" (Preface).[6]

There is a need for future studies with a larger patient sample in other geographic areas of Malawi, as well as locations with few resources compared to those with ample resources. Establishing motor skill level at the time of the home visit compared to status at rehabilitation discharge would provide further data about change in skill level relative to reintegration status.

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Chasing out traditional birth attendants in Ghana – implications for maternal and newborn health

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This paper reflects on a growing shift away from the training and use of traditional birth attendants (TBAS) to provide maternity care services in Ghana and calls for greater collaboration between TBAs and the health system in Ghana. The paper communicates personal reflections based on experiences working with communities to address barriers to maternal and newborn health care services in Ghana. It also draws on evidence from a larger research study examining the effects of Ghana's free maternal healthcare policy on women's maternity care seeking experience, equity of access and barriers to accessibility and utilization of maternal and newborn healthcare services. The design of this larger study involved analysis of nationally representative, retrospective household survey data in combination with qualitative exploration using focus group discussions, in-depth interviews, case studies and structured field observations in a total of six communities between November 2011 and May 2012. The study was comprised of 185 expectant and lactating mothers, 15 traditional birth attendants and 20 healthcare providers (i.e. community health nurses, midwives, doctors, health facility managers, district and regional directors of health, district and regional public health nurses, policy makers at the Ministry of health and Ghana Health Services).

Background

Like many countries in Africa, Ghana is a country where deaths from pregnancy and childbirth are very high. In 2007, maternal mortality accounted for 14% of all female deaths and continues to be the second largest cause of female mortality in Ghana.[1] In 2010, the WHO estimated that Ghana's maternal mortality ratio (MMR) was 350 per 100,000 live births.[2] Despite the fact that since 2003 Ghana has implemented a new maternal healthcare policy that provides free maternity care services in all public and mission healthcare facilities, recent survey data suggest that only 55% of women receive skilled assistance during delivery or postnatal care following delivery.[3] The survey also suggests that more than 30% of births still occur at home with traditional birth attendants (TBAs). This poor maternal health situation is compounded by widespread access inequalities among different socio-demographic groups across the country, with the rates of skilled attendance either stagnant or declining for poorer women.[2] This situation has partly been caused by limited access to skilled birthing services, especially in rural Ghana.[4]

Despite the low levels of maternal and newborn care access and the significant role TBAs continue to play in maternity care, the Ghana Health Service has largely failed to engage TBAs in the provision of maternal health services. TBAs, who are often illiterate elderly women and who usually learn their midwifery craft from personal experience and from older women in their community, have historically operated throughout Africa and Asia. During the 1970s-1990s the WHO, UN and donor agencies mooted the idea of formally recognizing and training TBAs to complement efforts aimed at improving maternal and perinatal health in low and middle-income countries.[5] Since then, the roles of TBAs have been the subject of fierce debate among maternal health professionals worldwide and several repeated assessments have been conducted to ascertain whether the strategy works.[5, 6-8] The recent 'Head to Head' debate "Are traditional birth attendants good for improving maternal and perinatal health?" highlights the attention TBAs and their practice continue to attract. In said debate, Kelsey Harrison, a retired obstetrician and gynecologist argues on one side that TBAs do more harm than good partly because of their lack of education and the unhygienic environment in which they operate8. Harrison's arguments are further grounded in a growing body of evidence that suggest that delivery in a health care institution or with skilled birth attendant (SBA) significantly reduces the chances of maternal and neonatal death compared to delivery by unskilled birth attendants.[9, 10]

Joseph Ana, a former Commissioner for Health, Cross River State, Nigeria, on the other hand believes that the shortage of skilled health workers in most developing countries means that TBAs have a valuable place in the delivery of maternal health care. Ana therefore argues that TBAs need to be trained and incorporated into the formal health care system to help improve women's access to skilled birthing services.[5] Ana's arguments are based on personal experiences in Nigeria as well as several studies that have indicated that TBA training and inclusion in maternal health service provision has the potential to improve maternal and perinatal health.

While the debate on TBAs remains unsettled, many developing countries including Ghana – with acute shortage of health resources and health care personnel – are discouraging the training and use of TBAs to provide maternity care services.[9,10] A closer, more personal look, however, reveals that increasing the training of TBAs to provide safe and effective access to life-saving maternal health services, particularly in rural areas where health care facilities are lacking and SBAs unavailable can be effective.

Findings – the case for TBAs training

Effective training, engagement, monitoring and supervision of TBAs could improve maternal and newborn health. From a six-

month observation of women and healthcare providers in Ghana, it was clear that TBAs still occupy an important position in maternal healthcare provisioning in Ghana. Qualitative interviews and regular interaction and conversation with community members, women, and TBAs suggested that TBAs are often seen as easily accessible, culturally competent and acceptable providers of maternity care services, particularly births at home in rural Ghana. One lactating mother says:

> In this community all pregnant women go to see Mma (Mother) Ramatu [referring to the community TBA]. She is very good. She delivered my son in my own home. She has delivered many pregnant women from this community and other neighboring communities without any problems. So we the women trust her more. She even knows our culture better than the health people at the hospital so when you go to her, she knows how to treat you well. That is why I will always go to her.

It was also clear that TBAs can attend to some of the longstanding barriers preventing skilled care seeking in health facilities, which are rooted in the beliefs and cultures of expectant mothers, such as burying the placenta around a home or in a warm place. These findings are in agreement with other recent studies elsewhere, which reported that some women preferred the services of TBAs because of their cultural sensitivity, easy accessibility and cheaper services.[11-13]

While several women expressed their satisfaction with, and desire for, the services of TBAs, health workers criticized TBAs for their lack of education, their limited understanding of the anatomic and physiological complexity of pregnancy and birth and their engagement in very dangerous practices during labor. For instance, TBAs were accused of not wearing hand gloves during delivery. Using bare hands to deliver women can easily spread infection from the TBA to the woman or her newborn. Health workers also criticized TBAs for failing to use clean cutting instruments such as blades to sever the umbilical cords of newborns; the use of unclean instruments has the potential to spread infection. More importantly, some health care workers argued that the conditions under which TBAs deliver pregnant women are such that the management of post-partum hemorrhage – one of the leading causes of maternal deaths – becomes difficult. In particular, some of the health care providers that were interviewed in the course of the research in Ghana said that TBAs do not have the technical know how and the basic equipment to provide live-saving blood transfusion services in cases where excessive bleeding and blood lost occurs. Others even blamed women's preferences for TBA services on the lack of education of such women. Such local criticisms resonate with some opinions in the literature, which argue that TBAs are the source of many risks that could be avoided with proper training.[8]

In Ghana, these criticisms of TBAs and their practices have divided the formal health system and the activities of TBAs. Even in regions such as the Northern region, where the formal health system continues to unofficially acknowledge TBAs as partners in maternity care, the relationship is neither clearly delineated nor cordial. Yet, face to face interactions with TBAs and women from the Upper West Region of Ghana reveal the potential value that TBAs could have in promoting effective access to maternal and child health care. This perspective comes from a pilot community-based health promotion project in several communities in the Nadowli District of the Upper West Region between 2005 and 2007.

The TBAs Training Project in the Nadowli District

This project was a partnership between Ghana Health Services and World Vision Ghana. The project involved the training of community-based surveillance volunteers (CBSVs) and TBAs in various aspects of community health including but not limited to reporting the outbreak of any disease and recording births and deaths in their community. As part of the project, several TBAs across 30 communities were trained to recognize the danger signs of pregnancy and to quickly refer pregnant women to the nearest health facility. All TBAs were also equipped with hand gloves, hand sanitizers, kerosene lanterns (for use in the night due to lack of electricity), new packs of cutting blades and other basic delivery and maternity care tools. The main purpose of the research was to both enhance the skills of TBAs and ensure that TBAs were relatively well resourced to handle uncomplicated deliveries, especially in remote rural communities where access to health care facilities is difficult.

The project also included a material reward package for TBAs who referred and/or encouraged pregnant women to attend antenatal care in a health facility setting. To ensure women's attainment of antenatal care, TBAs were encouraged to keep monthly records of all pregnant women they have referred or encouraged to seek care in a health facility. Local health care workers were also encouraged to ask and to keep records of all pregnant women who reported to the local health facility because of the advice from or referral by a TBA. Depending on the number of women that each TBA referred to the local health facility, appropriate monetary and other material rewards were given to the TBA. TBAs who physically accompanied pregnant women to the hospital to deliver were also given some instant monetary and material compensation.

It was clear that traditional birth attendants (TBAs) still occupy an important position in maternal healthcare provisioning in Ghana.

Impact of the TBAs Training Project

By the middle of 2007 when a preliminary evaluative survey was conducted, the number of women attending ANC in some communities had doubled – from 41% in 2005 to 85% in 2007. Qualitative discussions and interactions with both women and TBAs suggested that many women were encouraged by TBAs to seek health facility-based maternity care. Also, several TBAs reported that the training they had undertaken had enabled them to quickly refer women to health care facilities in emergency situations. For those TBAs who conducted home deliveries during the period, it was reported that infections due to TBAs' use of their bear hands and other unhygienic practices (e.g. using the same blades to cut the umbilical cords of two different babies) during labor, had also been reduced. This decrease was largely attributed to the TBAs' new supply of hand gloves, hand sanitizers and new blades (for severing off the umbilical cords after delivery). The TBAs' enhanced knowledge of pregnancy and labor management practices also contributed to the decrease in infection. Although the gains from this pilot project were relatively modest, the experience suggested that positive results in maternal and newborn health outcomes could be attained if TBAs and the health care system worked together.

The author's research in Piase—a rural community in the Bosomtwe district of the Ashanti region—where a trained government midwife trained and worked with TBAs on the issue of safe deliver—demonstrates the benefits of training and cooperating with TBAs.

Testimony of the Midwife in Piase

According to the midwife in Piase, before she was posted to work in the community in 2005, attendance at antenatal care (ANC) clinics was low. Women were delivering their babies at home despite the fact that maternal and newborn care services were provided free-of-charge at the health facility. According to the midwife the women were not delivering in the health facility because they were using the services of TBAs despite the fact that they charged a delivery fee of between 2-5 Ghana cedi (US$1 - 2.5). The TBAs were also actively discouraging pregnant women from seeking care at the health facility.

From this state of despair, the midwife discusses how she gradually and successfully engaged and worked with TBAs to increase demand for skilled maternity care services among women.

> One thing I did was to reach out to the TBAs…I visited each of the TBAs in the community to first introduce myself to them as the new midwife. During these intro-

> ductory meetings, I asked each of them about what they thought the problems of maternal healthcare were and how we could come together to work to make things better…you know the TBAs were very surprised that I was asking for their opinions because I was the midwife and I was suppose to know everything. But I said that, well I might not know everything and given that I am new in the community, I believe they [TBAs] could be of immense help…in fact, I later organized a meeting and invited all the TBAs to discuss how best we could ensure that no woman suffer or die as a result of pregnancy and childbirth. During the meeting I made it clear that they should see the problem of maternal health as belonging to all of us. I reassured all the TBAs that I did not come into their community to take their jobs, but to work with them so that together we could make things better. After this meeting, I worked closely with the TBAs and even went to help one of the TBAs conduct a delivery at home. It was through this that the TBAs came to realize that I had some skills that they didn't have. So they came to me and asked me to teach them how best to deliver women…I was really surprised. So (I) trained them and gradually, the TBAs started to encourage pregnant women to come to me for ANC and delivery. Now, the TBAs themselves will even bring the women to the clinic to deliver except when I am not around. We are all now working like a team, and I can say that it has contributed a lot to all the progress we are making.

Since the midwife (who is a trained skilled birth attendant) and TBAs (who are unskilled birth attendants) have become partners in promoting access and improvement in maternal and newborn, no maternal or neonatal death has occurred in the community since 2007. This sharp decrease contrasts with the district's average figure of four maternal deaths per year.

Since 2007 there have been no reported incidences of the common various debilitating consequences of pregnancy and childbirth such as chronic anemia, obstetric fistulae with urinary and or fecal incontinence, foot drop or palsy, urine prolapse or pelvic inflammatory disease. Indeed, anecdotal data extracted from records of the Piase health center show a steady improvement in the percentages of women who are able to access and use antenatal, delivery, postnatal, family planning and tetanus toxoid immunization services (see Figure 1). Both the midwife and TBAs attributed this improvement to increases in the proportion of women who now deliver at health facilities as well as to the training that the midwife gave to all TBAs.

Evidence from other TBAs Training Programs in Ghana

Various evaluations of programs, which promoted trained TBAs, have also indicated that TBAs' services could increase women's use of antenatal care and emergency obstetric care and decrease perinatal and neonatal mortality.[6, 14] Oxfam's work and research with 150 TBAs in six communities in Bolgatanga, Kassena Nankana and Bawku West districts of the Upper East Region of Ghana have demonstrated remarkable success.[15] According to the organization's monthly research report in each of the six communities, twice the number of women are now being referred by TBAs to clinics and hospitals for potentially life-saving care and support.[15] Maternal mortality has also reduced by 7%. These findings raise questions regarding why a stronger partnership has not been forged between the Ghana Health Service and TBAs.

Discussion and Reflection

Based on the observations above and the midwife's testimony it seems that criticisms and objections to the practices of TBAs emanate from a maternal health system that is increasingly haunted by, and intolerant of, fears of the 'old ways'. Ghana is progressively aiming to be a modern state, so the power of modernity consequently shapes ideas and practices relating to reproductive health policy and planning. For instance, Ghana's Reproductive Health Strategic Plan (2007-2011) emphasizes the reduction of maternal and neonatal mortality and morbidity through the modernization of obstetric care.

Encouraging all women to seek care from skilled health personnel is certainly critical for improving maternal and newborn health outcomes. Access to skilled ANC at health facilities can facilitate the detection and treatment of problems during pregnancy and provides an opportunity for health workers to inform women about their health and the danger signs associated with a pregnancy. It is during an antenatal care visit that screening for complications and advice on a range of maternity-related issues take place including counseling about healthy lifestyles. Studies have even suggested that early and regular contact with a formal healthcare system during pregnancy may also contribute to timely and effective use of services during and after delivery or in the event of an obstetric complication.[16,17] Similarly, it has been observed that a considerable number of problems that lead to maternal and newborn deaths occur during the postpartum period.[11] The first 48 hours following delivery are therefore critical for detecting and monitoring potential complications that, if unattended, could result in the death of mothers and newborns. Access to and use of post-delivery care services in government health facilities where skilled birth attendants are likely to be available can therefore enable health professionals to identify post-delivery problems including potential complications and to provide treatments promptly.

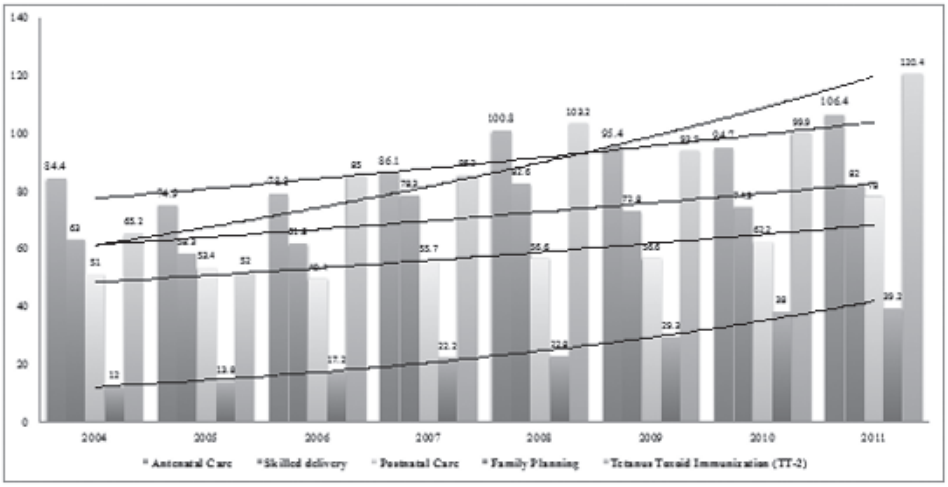
> The power of modernity consequently shapes ideas and practices relating to reproductive health policy and planning.

Given the shortage of skilled birth attendants (SBAs) in Ghana and across Sub-Saharan Africa as indicated by the latest WHO report on the 'state of the world's midwifery,'[18] it is clear that ensuring skilled attendance at all births is neither feasible nor achievable in the short term. In this context reasonably acceptable equity and efficiency arguments can be made for building working partnerships with and incorporating TBAs into the maternal healthcare system in contexts such as Ghana where skilled maternal healthcare provisioning is acutely limited. This is further supported by the observations of the pilot community-based health promotion project. Indeed, TBAs typically work in remote settings where women lack access to healthcare facilities despite the fact that such care is necessary and without cost. Furthermore, women often prefer TBAs for their cultural sensitivity, caused in part by their status as trusted members of the community, the fact that they speak the birthing woman's language and their understanding her tribal culture. The TBAs' close relationship with their clientele allows the practices of TBAs to persist.

Of course there can be real challenges in attempting to recognize, train, supervise and incorporate TBAs into the maternal healthcare delivery system. For instance, the midwife in Piase emphasized that she was able to work with TBAs by convincing them that she did not come into their community to take their jobs away but came to work with them to improve maternal health. Whether or not such an approach would succeed on a large scale is uncertain. Reaching all TBAs and integrating them into an already bureaucratic health service was also a major challenge in the community health project described above. This difficulty in integrating TBAs is worsened by the resentment of some trained health care workers towards TBAs. Similarly, the receptiveness of TBAs to training and modernization could also pose a challenge. This research with TBAs and midwives in communities such as Abono, Piase, Buipe, Mpaha, Sakpala and Tidrope, however, suggests that most TBAs are actually very receptive to training in modern ways of maternity care.

> The issue is not that we the TBAs don't want to receive training. As a woman who has experienced pregnancy and child-

Figure 1 Trends in Maternal Healthcare Access in Piase (2004 – 2011)



> birth myself, I am always concerned about the safety of all women who come to me for help. So I am always looking for ways to improve how I help the women to deliver or care for their pregnancy. Therefore, we the TBAs are happy to be trained by the midwives. The only problem is that sometimes the midwives and nurses think that because they have studied book, they know how to deliver women better than us…you know they feel that we are too traditional. When they treat us like this then some of us feel reluctant to go for training. But if they treat us well, I am sure every TBA will like to go for training (TBA, In-depth Interview, Piase).

Interviews and interactions with TBAs suggest that in many cases tension and disunity between TBAs and the formal health system only arise when health care professionals or the formal health care system look down upon TBAs. In some cases, the TBAs' fear that the healthcare system will deprive them of their source of livelihood leads to mistrust and lack of cooperation.

In attempting to train and work with TBAs, it is essential that systems be instituted to assure TBAs of their job security. It is also important that mechanisms are constructed to reward TBAs, especially those who accept to be trained. Indeed, in Piase TBAs who accept the training and encourage pregnant women to visit the health center or accompany pregnant women to the health center when they deliver are given small cash rewards. The scheme has proved to be cost-effective and efficient. This scheme could potentially be used in other contexts to engage TBAs as an effective complementary alternative solution for many women, because of the unavailability of many SBAs in rural settings and the long stretch of time before sufficient numbers of SBAs are trained to populate the entire health care system.

Before the cash rewards and incentive scheme can work effectively, the health system will need to first restructure itself to be more welcoming to TBAs. The healthcare system's lack of an underlying positive sentiment towards TBAs has caused mistrust between TBAs and health care personnel. It might also be useful to train health care workers to be more culturally competent. Since TBAs can already provide culturally competent birthing services to women, they [TBAs] can thus train the formal health care workers to be more engaged in, and to take account of, the cultural and local practices of childbearing women. Changing the attitude of health care workers towards TBAs is certainly a difficult task, and may not happen any time soon. However, the success that past TBA training programs have had, and the fact that SBAs are woefully inadequate and underrepresented in Ghana highlights the need to continue training both TBAs and SBAs and encouraging them to be more tolerant of each other.

Conclusion

Despite the potential dangers associated with the practice of TBAs, access to and use of maternal and newborn care services in Ghana is better promoted when TBAs are trained and integrated within the modern health system. The experiences of the midwife in Piase - how she reached out to local TBAs,and succeeded in collaborating with them to increase demand for skilled maternal and newborn care services – demonstrate the importance of cooperating with TBAs. The experience also suggests that if all midwives can approach TBAs in similar ways, successful maternal and child health related MDGs could be attained.

Given the shortage of SBAs in Ghana and high regard for their services in many communities, the formal health care system should ally themselves more with TBAs. The Ghana Health Services, for example, could use innovative incentive mechanisms such as public recognition or cash rewards to encourage TBAs to promptly refer mothers to healthcare facilities especially during labor. Indeed collaboration will also enable the health care system to identify, train and enhance the skill set of TBAs. Partnerships between TBAs and SBAs would also help health care workers to become culturally sensitive to the needs and concerns of childbearing women. Even if the Ghanaian health system were to train and deploy sufficient numbers of SBAs to all parts of the country in the future, TBAs could still play important roles in helping health care workers to provide culturally competent care. In particular, TBAs could still mobilize and persuade women at the community level to seek skilled care services in health care facilities. However, Before an effective collaboration and the associated benefits can occur, TBAs and the healthcare system in Ghana must see each other as partners in maternal health rather than competitors.

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