

Perspective

South-to-North, Cross-Disciplinary Training in Global Health Practice: Ten Years of Lessons Learned from an Infectious Disease Field Course in Jamaica

Henry P. Scarlett,* Richard A. Nisbett, Justin Stoler, Brendan C. Bain, Madhav P. Bhatta, Trevor Castle, Judith Harbertson, Stephanie K. Brodine, and Sten H. Vermund

Department of Community Health and Psychiatry, and Office of the Vice Chancellor, University of the West Indies, Mona, Kingston, Jamaica; Department of Global Health, College of Public Health, University of South Florida, Tampa, Florida; Department of Geography, and Graduate School of Public Health, San Diego State University, San Diego, California; School of Public Health, Department of Biostatistics, Environmental Health Science and Epidemiology, Kent State University, Kent, Ohio; U.S. Military HIV Research Program Naval Health Research Center, San Diego, California; Institute for Global Health, and Department of Pediatrics, Vanderbilt University School of Medicine, Nashville, Tennessee

Abstract. Global commerce, travel, and emerging and resurging infectious diseases have increased awareness of global health threats and opportunities for collaborative and service learning. We review course materials, knowledge archives, data management archives, and student evaluations for the first 10 years of an intensive summer field course in infectious disease epidemiology and surveillance offered in Jamaica. We have trained 300 students from 28 countries through collaboration between the University of the West Indies and U.S. partner universities. Participants were primarily graduate students in public health, but also included health professionals with terminal degrees, and public health nurses and inspectors. Strong institutional synergies, committed faculty, an emphasis on scientific and cultural competencies, and use of team-based field research projects culminate in a unique training environment that provides participants with career-developing experiences. We share lessons learned over the past decade, and conclude that South-to-North leadership is critical in shaping transdisciplinary, cross-cultural, global health practice.

BACKGROUND

Globalization of commerce and travel has had profound implications for the control of infectious diseases. With our ability to travel between remote and urban regions, and across continents, in less time than the lower range of incubation periods for most pathogens, attention to emerging infections has become a permanent imperative and a priority for global health education. In the United States, growth in global health courses has been explosive over the past decade, with enrollments doubling in the last three years at 37 colleges and universities,¹ and recent study panels have prioritized partnerships in the global community.^{2,3} To effectively address modern infectious disease challenges, public health education must promote scientific and cultural competencies framed within a field-based curriculum. Infectious disease control and prevention demand that students and practitioners gain on-the-ground experiences to build multidisciplinary skills that prepare them for multinational collaborations.

Many recent commentators have stressed the need for relevant, multi-disciplinary training for a new generation of public health and disease ecology professionals.^{4–7} This need was prescribed in the Institute of Medicine's recent guidelines for public health education as the 'ecological model' of population health, which emphasizes the linkages between biological, environmental, and behavioral determinants of health.⁸ The United Nations' Millennium Development Project prioritizes transnational collaborative efforts for public health education and training,⁹ and current medical and public health school applicants continue to stress the importance of global health opportunities in their career decisions.¹⁰ Additionally, the importance of in-country partners versus medical tourism has

also been stressed. Organizers of the Gorgas Course in Clinical Tropical Medicine¹¹ taught annually in Peru observe that "[S]table professional relationships between multiple educational partners are required for an endeavor of this scope...provided that the organization in the planning country has strong, pre-established relationships with the host institution(s)."¹² The standards recently published by the Working Group on Ethics Guidelines for Global Health Training (WEIGHT) underscore the benefits of properly conceived and executed field training opportunities for all involved.¹³

We report on a "South-to-North" experience in global health education conducted in a middle-income developing country by committed partners from the host nation (Jamaica) and a partner country (United States). In an annual 10-day intensive field course taught at the University of the West Indies, Mona campus (UWI), we bring together biomedical scientists and public health practitioners with various programmatic orientations, administrators, and policymakers, and professionals with expertise in information technology, vector control, clinical medicine, and anthropology to meld their diverse approaches, skills, and interests on behalf of an international student clientele. This report summarizes our experiences in creating a multi-lateral training opportunity that emphasizes global health field work and is mutually beneficial to all institutional participants. We comment on WEIGHT guidelines that have had the biggest impact in our program's success, and reiterate the importance of multidisciplinary global health education recently espoused by the American Society of Tropical Medicine and Hygiene.¹⁴

SETTING AND COURSE OBJECTIVES

Jamaica is located 550 miles (917 km) south of Miami and is the largest English-speaking Caribbean nation. Jamaica's population is 2.7 million, and major industries include tourism, mining, and agriculture. Kingston is the capital and the largest commercial center. The course, entitled *Infectious Disease Epidemiology, Surveillance, and Control*, is offered

*Address correspondence to Henry P. Scarlett, Department of Community Health and Psychiatry, University of the West Indies, Mona Kingston 7, Jamaica. E-mails: henpscar@gmail.com or henry.scarlett@uwimona.edu.jm

jointly by the Department of Community Health and Psychiatry at UWI, the Sparkman Center for Global Health at the University of Alabama at Birmingham (UAB), and the Graduate School of Public Health at San Diego State University (SDSU). Approximately 30 participants and 5–6 faculty from UAB, SDSU, and other U.S. institutions, convene at UWI for the course each summer. The Jamaican Ministry of Health (JMOH) has made significant contributions to didactic and field activities by sponsoring and guiding several key field activities and guest faculty from Rice University, Auburn University, Vanderbilt University, and Texas Tech University have made additional teaching contributions.

The University of the West Indies is a dynamic, international host institution serving the 17 countries and territories that form the Commonwealth (English-speaking) Caribbean. The university was established at the Mona campus in Kingston in 1948 as a college of the University of London, and gained full university status in 1962. This university is the region’s premier educational institution and offers a wide range of undergraduate and graduate programs in humanities and education, pure and applied sciences, engineering, agriculture, law, medical sciences, and social sciences. The safe, picturesque campus has state-of-the-art information technology, convenient classroom facilities, and residential living with low-cost cafeterias offering typically Jamaican foods. The Faculty of Medical Sciences and its clinical facilities are complemented by additional health-related research resources in Kingston and at the JMOH.

The major objectives of this problem-oriented course are to 1) provide an integrated, multidisciplinary public health experience in the context of daily field work and in-service visits to active programs in Kingston and its environs; 2) promote critical thinking and contrast problem-solving techniques in a resource-constrained setting vis-à-vis options in a resource-rich setting; 3) emphasize the relevance of cultural competence and social medicine to disease control and prevention; and 4) empower students to generate, analyze, and present multifaceted field data.

The course is organized around three core infectious disease categories: human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) and sexually transmitted infections (STIs), vector-borne illness, and water-borne and sanitation-borne illnesses. In addition, the course typically investigates late-breaker issues of topical importance, including risks from bioterrorism, severe acute respiratory syndrome, avian influenza, multi-drug resistant tuberculosis, malaria reintroduction to Jamaica, and ethical issues in international research. By emphasizing the integration and application of classroom, laboratory, and field experiences, the course fosters problem-solving skills for infectious disease ecology, surveillance, control, and prevention.

COURSE ORGANIZATION AND INSTRUCTIONAL FORMATS

The course was designed for students focusing their careers on international and global health with backgrounds in public health, environmental health, medicine, evolutionary biology, medical anthropology, nursing, or other allied-health disciplines. Originally developed by UWI and UAB in 2000, the course aims to integrate field epidemiologic methods, tropical infectious diseases expertise, and service-learning in a lower-resource environment. In 2004, the Graduate School of Public

Health at SDSU joined the partnership. Each partner institution recruits and screens their student participants separately, but logistics and budgets are jointly managed.

Participants from U.S. institutions are vetted from applicants responding to local course advertisements. The 20–22 American students, typically sourced from Masters and Doctoral programs at UAB or SDSU, enroll for credit at their home institution. The 12–15 Jamaican participants, who are primarily MPH students at UWI but also include specially selected public health field officers used employed to the JMOH, take the course as an MPH elective or as Continuing Education. Given UWI’s international student body, the Jamaican assemblage typically represents 3–5 Caribbean nationalities. Students from UAB have included American and overseas trainees, the latter studying for MPH or DrPH degrees sponsored by Fogarty International Center Fellowships in the United States. As a consequence, the U.S.-based students also usually originate from 3–5 nations each year, with past representation from China, Mongolia, India, Pakistan, Bangladesh, Zambia, Rwanda, and Ukraine.

In the first 10 years (2000–2009), 300 students representing 28 countries have participated; their respective nationalities, professions, and degree programs are listed in Table 1. Most participants were Jamaican or American, health professionals or full-time students, and pursuing Masters Degrees in public health. The average enrollment has been approximately 30 students per year (range = 18–37 students). Two enrollment trends were observed: an increase in the number of female participants, and a decrease in MD/PhD/DrPH-seeking participants in favor of more MPH students. Although women outnumbered men by 2 to 1, participants represented most major categories of public health professions. Several factors have contributed to these trends, but the primary drivers have most likely been faculty turnover and institutional initiatives. More

TABLE 1
Course participants (n = 300) by nationality, professional background, and degree program, Jamaica, 2000–2009

Characteristic	No. participants	%
Country*		
Bangladesh	4	1.3
Guyana	5	1.7
India	4	1.3
Jamaica	109	36.3
United States	127	42.3
Zambia	15	5.0
Other†	36	12.0
Professional background		
Physician/dentist/faculty	48	16.0
Nurse	46	15.3
Public health inspector	42	14.0
Pharmacist/contact investigator	10	3.3
Student only‡	104	34.7
Allied health/laboratory technician	18	6.0
Administrator/manager	5	1.7
Other	27	9.0
Program of study		
DrPH/MD/PhD	20	6.7
MPH/MSPH	223	74.3
Undergraduate, other MS	17	5.7
Continuing education	40	13.3

*Vanderbilt University, University of Alabama at Birmingham, and the Center for Infectious Diseases Research in Zambia have Fogarty training grant collaboration responsible for bringing students to the United States for public health training.

† 1–3 students each from The Bahamas, Bangladesh, Barbados, Belize, Burma, Canada, China, Cuba, Dominica, Kenya, Mongolia, Montserrat, Nigeria, Pakistan, Rwanda, St. Vincent and the Grenadines, Saudi Arabia, Trinidad and Tobago, Turks and Caicos, Uganda, and Ukraine.

‡ Listed under their primary profession, if both student and professional.

U.S.-based students opted to join the water and sanitation or vector control thematic teams (described in detail below), and Jamaican-based students were more likely to select the HIV/STI team. Student evaluations showed this self-selection as a desire to gain experience in a new substantive area in which they lacked adequate previous exposure in their home country, a choice explicitly encouraged by the instructors.

American student costs are covered by course tuition and fees. Jamaican students are supported by the Sparkman Center. The UWI Department of Community Health and Psychiatry recruits faculty and provides classroom facilities, equipment, transportation, and administrative support. All students and faculty are housed in UWI student residence halls to promote opportunities for social and cultural exchanges among the diverse student and faculty group. While off campus, students can also take advantage of extracurricular discussions with public health program managers and leaders and ordinary Jamaican citizens.

The instructional format uses online preparatory lectures and readings, on-site lectures from subject matter experts, group field visits to Jamaican health facilities, and team field projects in local communities near Kingston. The course begins at UWI each August, lasts 10–12 days, and has 8–16 contact hours daily. Sample daily schedules and a summary of contact hours are shown in Tables 2 and 3. Students are evaluated on the basis of participation in group activities and field visits, their team field project presentation, completion of a daily personal journal, and, originally, a comprehensive final examination that covered pre-departure and on-site material (the final examination evolved into a pre-departure assessment as described later).

Online preparatory lectures and readings. Soon after accepting students into the course and collecting initial financial deposits to secure enrollment, the U.S. institutions

TABLE 3
Typical preparatory and on-site contact hours for key course activities, Jamaica*

Activity	Contact hours by field team			Context
	HIV	WS	VC	
Pre-course readings	20	20	20	Class
Pre-course lectures	15	15	15	Class
Course orientation	2	2	2	Class
Onsite lectures	10	10	10	Class
Field visits	9	9	9	Class
Team planning meetings	15	15	15	Teams
Educational workshops	4	0	4	Teams
Specific team field visits	16	13	0	Teams
Community survey	8	0	12	Teams
Mosquito trapping and laboratory work	0	0	16	Teams
Data analysis, preparation for team presentation	15	15	25	Teams
Field trip to Ocho Rios for recreation, culture, and team-building activities	12	12	12	Class
Team presentations and course evaluation	2	2	2	Class
Examination	2	2	2	Class†
Closing ceremony	1	1	1	Class
Total	123	124	145	

* HIV = human immunodeficiency virus; WS = water and sanitation; VC = vector control.
† United States-based students from the University of Alabama at Birmingham and San Diego State University take the course for credit. Students from the University of the West Indies and the Jamaica Ministry of Health take the course for continuing education and do not sit for the examination.

conduct orientation and discussion sessions with their students. Two months before departure, preparation includes the completion of approximately 10 hours of internet-based video lectures provided via online streaming video or CD-ROM. In addition, there are required readings that consist of recent peer-reviewed articles and textbook chapters related to the on-site lecture content. All preparatory materials are posted on

TABLE 2
Three representative days of activities organized chronologically by the field team, Jamaica*

Time	Activities by field team			Context
	HIV	WS	VC	
Day 1				
8:30–09:30 AM	Course orientation and mechanics: students matched to teams			
9:30–10:30 AM	Lecture: Rodent control strategies			Class
11:00 AM–NOON	Lecture: Water and sanitation principles			Class
1:30–6:00 PM	Field visits: Mona water treatment plant and UWI sewage treatment plant			Class
7:30–9:00 PM	Teams organize and develop research design for field projects; introduce laboratory materials for vector and water teams			Teams
Day 2				
8:30–9:30 AM	Lecture: HIV/AIDS control and prevention in Jamaica			Class
9:30–10:30 AM	Lecture: Community education and mobilization for HIV care			Class
11:00 AM–NOON	Lecture: Vector control and disease surveillance in Jamaica			Class
1:30–5:30 PM	Field Visit: Mosquito breeding sites and larvae collection			Class
7:00–9:00 PM	Plan HIV prevention, care, and treatment workshop to conduct among PLWHA	Develops questionnaire for community survey	Sets CDC light traps and retrieves them in the morning	Teams
Day 6				
8:30 AM–6:00 PM	Morning I: field visit to AIDS hospice Morning II: field visit to support co-op for PLWHA Afternoon: conduct HIV workshop for PLWHA and community health workers	Conduct KAP survey in a selected rural community and meets with community leaders/stake-holders	Conduct <i>Aedes aegypti</i> larval survey and KAP survey in a selected rural community; meet with community leaders	Teams
9:00 PM–2:00 AM (variable)	Participate in on-site community interventions with JMOH employees Visit STI center targeting female sex workers	Rodent control at Kingston wharf/docks	Setting up light traps (performed multiple nights)	Teams

* HIV = human immunodeficiency virus; WS = water and sanitation; VC = vector control; UWI = University of the West Indies; AIDS = acquired immunodeficiency syndrome; PLWHA = persons living with HIV/AIDS; CDC = Centers for Disease Control; KAP = knowledge, attitudes, and practices; JMOH = Jamaica Ministry of Health; STI = sexually transmitted infection.

a course web site and provide a common baseline of etiology, surveillance, and control methods for each of the three core content areas (HIV/AIDS/STIs, vector control, and water and sanitation).

On-site lectures. Lectures and briefings are presented at UWI, principally by instructors from the partner institutions, JMOH, and local experts. Guest lecturers have included physicians, allied health practitioners, surveillance officers, non-governmental organization leaders, and former patients. Lectures are generally limited to 2–3 hours daily during the first 3–4 days, and are usually held in the morning to ensure free afternoons and evenings (and occasionally early mornings or late nights) for field work.

Group field visits. Group field visits were nested within active JMOH or community action public health projects through a wide range of public health advocates, health educational professionals, community stakeholders, and government institutions participate. Each summer, a minimum of three field experiences are linked to each of the three core course topics. The HIV/AIDS issues have been highlighted through group visits to the Center for HIV/AIDS Research, Education and Services; the UWI HIV/AIDS Response Program; the Comprehensive Health Center; the UWI Microbiology Laboratory; the Jamaican AIDS Support, which was the first Jamaican non-governmental organization to serve persons with HIV/AIDS; and The Lord's Place, a Catholic hospice in Kingston run by the Missionaries of the Poor for persons with advanced HIV/AIDS or without homes or family support. Vector control issues are typically addressed by a field visit to the St. Catherine Health Department, where mosquito control specialists lead a hands-on tour through local breeding hot spots for *Aedes aegypti* and *Anopheles albimanus* mosquitoes, the respective local vectors for dengue fever and malaria in Jamaica. Water and sanitation issues are highlighted by visits to the National Water Commission drinking water and sewage treatment plants; the National Public Health Laboratory and National Water Commission laboratory where water quality testing is performed; and Port Health and Quarantine Services in Kingston. These field visits are typically half-day activities, and often there are follow-up activities that piggy-back on existing community health programs and give students additional exposure while at UWI. The three core field visits are typically integrated with subsequent student field projects, which become the focus of the last few days of the course.

Team field projects. Participants from all institutions are divided into three teams, each supervised by one or two instructors, to pursue field projects in each of the core thematic areas. Students engage with their respective teams for the duration of the on-site course and receive in-depth exposure to their respective theme. All three groups feature a cross-cutting emphasis on case surveillance, prevention, and control. The HIV/AIDS/STI (HIV) team focuses on developing a workshop with prevention and care messages for a HIV-positive support group. The Vector Control (VC) team co-emphasizes mosquito surveillance and species identification, and Water and Sanitation (WS) team evaluates potability of drinking water supplies, effluent quality of sewage disposal systems, infrastructure needs, and related issues of rodent control. In the first few years of the course, each team would independently identify a research topic, devise a strategy to address the questions posed, and spearhead the collection and

analysis of field data. More recently, best practices from each of the three teams have evolved into semi-canned exercises that maximize the student experience because these focused activities are generally limited to just 2–3 days of field contact. On the final day of the course, each team presents its findings for discussion and critique. These team exercises enable a diverse student body to share intercultural experiences, and depending on the team, acquire new skills in health education, laboratory testing, household surveying, and general skills in collecting, synthesizing, and presenting public health data. Specific examples of typical team projects are detailed below.

The WS team introduces participants to local technologies for the provision of potable water and the appropriate management of liquid and human waste in a low-resource setting. Discussions take place in the context of the Millennium Development Goals for water and sanitation and to emphasize the point that despite limited resources Latin America and the Caribbean are on track for meeting these goals by 2015. The team visits major water treatment plants including slow-sand and rapid-sand filtration systems, and wastewater treatment facilities including trickling filter, activated sludge, lagoons, and stabilization ponds. The team has visited local communities to collect and analyze water samples for residual chlorine and coliform organisms, administered household surveys about water storage and use, health behaviors, and diarrhea prevalence in inner-city communities, and more recently conducted focus groups to identify community needs. The results of these inquiries are presented back to the community at the end of the course. The team has also conducted rodent assessments at the national seaport and the uptown restaurant district.

The VC team has worked closely with the Mosquito Control Unit at the St. Catherine Health Department for the life of the course. This team typically performs mosquito surveillance through collection of adult mosquitoes using Centers for Disease Control light traps and larval and pupal collections by using dippers. Specimens are keyed to species in laboratory sessions under the supervision of an expert entomologist. The VC team has traditionally conducted household larval surveys for *Ae. aegypti*, a primary vector of dengue fever in Jamaica, calculating *Stegomyia* indices (i.e., house, container, and Breteau), and informally educated communities and households on mosquito-borne diseases and vector control. A knowledge, attitudes, and practices survey was eventually implemented to complement the larval survey. A formal health education module was recently added, and students created a game-show style activity that pitted teams of residents against each other to answer basic questions about dengue fever causes and prevention. The game ends with colorful informational posters about dengue that remain with the community and a luncheon for participants. Since the course's inception, all mosquito species of local medical importance (e.g., *Culex* spp., *Ae. aegypti*, *An. albimanus*, *Psorophora* spp., *Ochlerotatus* spp.) and other rarer species of local interest (e.g., *Cx. bahamaensis*) have been collected. In particular, adults and larvae of the primary local vector of malaria (*An. albimanus*) are collected every year. Despite our confirmation of robust malarial species populations year after year, we were unable to persuasively communicate the potential for autochthonous transmission to the JMOH; in September 2006, an outbreak of imported *Plasmodium falciparum* and

P. vivax malaria in Jamaica initiated autochthonous cases. The island, having been certified free of malaria since eradication in 1965, experienced more than 390 cases,¹⁵ lost tourism revenue, and incurred enormous costs of containment and treatment.

The HIV team visits local facilities engaged in surveillance, diagnosis, and patient care and interacts with local prevention experts from community-based and faith-based organizations. Because of the sensitivity of HIV testing, and particularly salient stigma toward HIV patients in Jamaica, no primary seroprevalence data is collected. The team has encoded, transformed, and analyzed secondary data from STI clinics and learned how data entry and data structure differ from more economically developed nations. Over the past few years, field activities have shifted toward qualitative methods and health education. Students have developed workshops for persons living with HIV/AIDS; these involve targeted messages and skits delivered through interactive mini-sessions with post-workshop evaluation and the production of draft materials that are shared with the organization. Teams have also engaged local outreach workers, participating in safe-sex demonstration activities in nightclubs and interviewing commercial sex workers to understand their perceptions of risk and their challenges in obtaining care. Community outreach is performed with JMOH or non-governmental organization staff, and students accompany local HIV/STI health educators in small groups of 2–4 in public and high-risk settings, such as the clubs and housing projects.

These three team field projects continue to reflect public health concerns in many of our students' home countries. The prevalence of HIV/AIDS in the Caribbean region is second only to sub-Saharan Africa; dengue and malaria remain endemic to the Caribbean, and Jamaica has experienced outbreaks of each disease over the past decade; water and sanitation issues remain major public health challenges both regionally and globally. The course succeeds in its intent of exposing participants to some of the world's most pressing public health challenges.

Evolution through evaluation. Student course evaluations have informed the evolution of course content and pedagogy. Students are required to submit three separate evaluations: one rating each lecturer and team leader's performance, a second evaluating overall effectiveness of course logistics and experiences, and a peer evaluation of their project team. The course faculty submits written feedback to the students for each of the three project team presentations on the final day of the course. As the course evolved, the student evaluations changed to reflect new modules and activities; thus, data gathered in latter years are not directly comparable with earlier reviews. In lieu of a quantitative assessment, a qualitative look at the data gathered over the past 10 years yields many lessons learned about what continues to make this course a compelling global health field experience.

Student evaluations of course materials and instructors over the 10-year period demonstrate that enrollees were highly motivated to take the course. The most highly rated course aspects in student evaluations include the knowledge level and experience of faculty and lecturers, the diversity of field visits and team work, integration with international students, and the collegial course environment. Students from Africa and Asia who were studying in the United States expressed their appreciation of seeing a reasonably successful public health model built

on far fewer resources than are available in the United States; their Jamaican experience offered them models that were more realistic for their home settings than U.S. approaches.

Student feedback has helped improve the quality of field activities each year. The team field projects originated in 2000 primarily as epidemiologic methods-driven exercises. Field interactions focused on methods exchanges between students, JMOH officers, and local health professionals, and the data generated was primarily used by JMOH. The shift toward blending classic epidemiologic methods with community-based health education was a result of increasingly diverse enrollees, particularly from the field of health promotion and education, and student evaluations that clamored for more community face-time during the course. Student feedback has also led to the strengthening of the laboratory component for mosquito identification, expanded visits to both local public health facilities and high-risk intervention settings, and the incorporation of global positioning systems into field exercises so participants can expand their methods tool kit.

The two most frequently cited student complaints were too short a timeframe for the course, and too long a reading list before departure. Although the course length has remained the same because of budget limitations and UWI housing availability, the number of contact hours has actually gradually increased; annual repetition of field visits yielded efficiencies that enabled expanded field activities. Despite the increased intensiveness over the years, students have not felt overwhelmed, but rather consistently expressed regret at not being able to do more in Jamaica than their brief project work would allow. As for the reading list, we have continually updated the pre-departure readings to provide the most current and relevant preparatory material available. During 2000–2006, the internet lectures and readings were reduced by 50%. This reduction has helped keep instructors current on the latest regional issues, and whittled down the pre-departure time commitment without diluting content. Preparation for the final comprehensive examination administered in Jamaica was also perceived by students as undermining their field and cross-cultural experiences. In 2008, the examination was converted into a pre-departure evaluation of the preparatory materials that is administered to students in July at each participating U.S. institution. Students were ultimately better prepared for the course and had more time for field activities.

Student feedback has revealed challenges and rewards inherent in balancing cultural immersion with education in such an intense course environment. Our ability to simultaneously provide comparable cultural and educational opportunities for host and visiting students, and for local health professionals and our study communities, is the subject of our closing discussion.

DISCUSSION

The course *Infectious Disease Epidemiology, Surveillance, and Control* has been held annually each August and is established at each partner institution as a premier field work opportunity. It was conceived and organized around the premise that “experiencing countries and cultures from within and outside of traditional academic walls offers students numerous opportunities for personal and professional growth”.¹⁶ We have taken a multidisciplinary approach to integrate the biological and social sciences, maintained a multicultural emphasis via

cross-institution team work, and fostered intercultural exchange through social activities geared toward Jamaican cuisine, fine arts, and history. The success of the course is predicated on ideals and institutional synergies similar to those emphasized by the WEIGHT.

The recently devised WEIGHT guidelines for global health training programs represent an important effort to codify ethics and best practices for sending and host institutions, program participants, and sponsors. These guidelines were, by the WEIGHT's own account, created with limited evidence to inform the development process, and a significant obstacle to generating such supporting evidence is the difficulty in measuring the performance of training programs. Because there are numerous competing factors that shape the pursuit of higher education and careers in global health, we can only offer anecdotal vignettes of how course participation has altered careers. Many participants have gone on to demonstrate new awareness and skills forged during this course. Public health inspectors enrolled in the course by JMOH have noted the value of the course's mosquito control activities, returning to their jobs with new skills that led to enhanced mosquito control programs in their regions. Mosquito surveillance equipment such as light traps were donated by course faculty to the St. Catherine Health Department where officers have since reported that mosquito trapping and species identification, skills acquired in this course, have become an integral part of health department mosquito control and public education efforts. There have also been a handful of American students who were sufficiently inspired by their time at UWI to subsequently focus their careers on international health issues, and in a few cases pursue doctoral degrees in global health or a related field. Another proxy for success might be the surge in student interest in this course and other international offerings at each partner institution over the past decade, which recently translated into waiting lists for this course.

It is perhaps more instructive to explore how our lessons learned emulate the core benefits and risks identified by WEIGHT while avoiding so-called parachute research.¹⁷ We close by summarizing our most significant lessons learned during implementation of the course over the past 10 years; these lend considerable support to the spirit of the WEIGHT guidelines, and should be of interest to anyone developing global health training program curricula.

We have built a mutually beneficial program based on previous American and Jamaican institutional relationships, and we have committed to a detailed planning and review process with face-to-face encounters and brainstorming from the outset. Benefits and risks are spread as evenly as possible among all institutions. A major drawback is that most UWI students and affiliates do not yet receive a reciprocal opportunity to study abroad in the United States explicitly through our program. However, as a result of this course, one UWI faculty member received funding for a terminal degree at a partnering U.S. institution.

We have identified appropriate facilities and resources, local experts, and field settings to facilitate our learning objectives. We have a cross-institutional management team for planning and logistics, and institutional stakeholders participate in all decision-making. Likewise, we have recruited diverse faculty from the biological and social sciences and incorporated cross-disciplinary perspectives into the course syllabus. It is our firm

belief that global health competency is attained by the integration of biomedicine and social medicine.

We have recruited and trained a diverse group of student and professional participants and fostered a cooperative learning environment. Every element of the course is designed to encourage participant interaction whether it be in the lecture room, in transit to field exercises, during the planning and execution of team projects, evening social events, or simply sharing meals at the UWI cafeteria and dormitory accommodations. Visiting participants receive orientation before departure and are prepared to demonstrate cultural competency from the first night in Jamaica. Participants take ownership of the team field projects and feel invested in the outcomes after just a few days of field work. Our emphasis on extra-curricular, cross-cultural, and interpersonal experiences builds trust, enhance communication, and expand professional networks.

We have devised collaborative field opportunities that generate quantitative and qualitative primary data consistent with the mission of local JMOH offices or community health organizations. Our faculty's diverse methods background has yielded a mixture of applied methods including focus groups, in-depth interviews, household questionnaires, larval container surveys, geographic techniques, and observation-based assessments. When primary data collection is not feasible, groups analyze secondary data in cooperation with JMOH or other local officials. Peer-reviewed publication of results is possible¹⁸ but remains challenging given the short time frame for data collection.

We have effectively leveraged technology to substitute narrated presentations, internet-based lectures, and readings for classroom time. This leveraging maximizes the field experience for experiential learning and extends the breadth of the material covered. Although the use of electronic educational media is becoming commonplace in the United States and Jamaica, training programs must be wary of access disparities and technology platform incompatibilities while working abroad.

We have established strong links with communities that enable field work, and project teams present findings to community leaders to encourage local leadership in seeking solutions. Our evolution toward a community-based teaching model has been an important part of our success. When the course was initiated, the group projects were designed primarily to enable participants to collect and analyze secondary data. A shortcoming of these early projects was the failure to establish solid relationships with communities so that local problems could be addressed by involving and energizing community participation. As teams increasingly visited local communities to conduct surveys, there was an opportunity to use a classic participatory approach.¹⁹ Beginning in 2006, we made a concerted effort to introduce didactic material on community-based, participatory approaches, mandating that all groups focus on community participation. Community surveys were expanded and groups presented results back to the communities. Beginning in 2007, students from SDSU and UAB have donated back-to-school items for children in Mona Common, an established informal squatter community near UWI, where the WS team has established strong links through repeated visits.

We have assisted local communities in raising consciousness about socioeconomic disparities, particularly those related to education and child welfare in the poorest communities.

When working with marginalized populations, short-term training programs in global health face particularly salient ethical issues.²⁰ We have been sensitive to ethical issues related to community-based education and require students to meet local standards before joining the course. At SDSU and UAB, students are required to complete a Study Abroad Orientation; this session highlights best practices in navigating cross-cultural immersion, and requires satisfactory completion of a short examination. In addition, when results of team field projects were anticipated to become data sources for Masters theses (which has occurred for U.S. students on three occasions), students have authored their own protocols for both the U.S. Institutional Review Board and the UWI/UHWI Ethics Committee in Jamaica. It is standard practice for students at UWI who participate in human research projects to submit their protocols to the UWI/UHWI Ethics Committee for approval.

CONCLUSIONS

Analyses of quantitative and qualitative student evaluations have motivated us to refine the course content and pedagogy over the years. Our course fills a gap in training regarding global-health needs, approaches and experiences, and has become a core offering that often solidifies student commitments to global health careers. Despite some challenges, the myriad rewards from this course validate the benefits of cross-disciplinary and cross-national collaborations, and confirm the value of partnerships derived from and cemented by these joint endeavors. We believe that not only do such experiences promote professional growth for all involved, augment social advocacy for global health, and facilitate fruitful research opportunities, but that these experiences are also essential to forge transnational and transdisciplinary networks through which we advance global health practice. We join others in calling for more multilateral partnerships in service learning and for creating new and exciting models to foster intra-university and cross-national collaborations,^{10,13,21} working together towards evidence-based implementation practice^{13,22} and “a coevolving set of collaborative, global institutions” better able to navigate global change.²³

Received September 20, 2010. Accepted for publication May 17, 2011.

Acknowledgments: Many persons have assisted with this course over the past decade. We thank Dr. Eddie Cupp, Mr. Milton Pinnock, and Dr. Peter Figueroa for helping to conceptualize the first year of the course; Dr. Sheila Andrus, Mr. Frank Romanowitz, Dr. Nalini Sathiakumar, Dr. Craig Wilson, Dr. Mukesh Patel, Mrs. Heather White, and other UAB staff members at the Sparkman Center for Global Health for spearheading program logistics and funding for the Jamaican-based participants; Professor Denise Eldemire-Shearer (Head, Department of Community Health and Psychiatry); Ms. Donna Simon and Mrs. Mornan Pinnock (Office Managers), and lecturers Mrs. Althea Bailey and Mr. Norbert Campbell at the Department of Community Health and Psychiatry, UWI, for helping to run the course smoothly year after year; Dr. Tina Hylton-Kong, at the Comprehensive Health Center for her dedication to the program year after year; Dr. Francia Prosper-Chen (Medical Officer, Health) and other members of staff at the St. Catherine Health Department for their significant contributions; Mr. Simeon Bromfield for being a dedicated partner to our vector control work; Dr. Parris Lyew-Ayee (Mona Geoinformatics Institute) for providing imagery and technical guidance; Mr. Winston (Bobbie) Grant and other UWI drivers for graciously providing off-hours duties delivering us to our destinations safely; and additional leaders too numerous to mention from aforementioned organizations, institu-

tions, and agencies for facilitating the numerous field visits and welcoming our partnership into their respective communities.

Authors' addresses: Henry P. Scarlett, Department of Community Health and Psychiatry, University of the West Indies, Mona Kingston 7, Jamaica, E-mails: henpscar@gmail.com or henroy.scarlett@uwimona.edu.jm. Richard A. Nisbett, Department of Global Health, College of Public Health, University of South Florida, Tampa, FL, E-mail: rnisbett@health.usf.edu. Justin Stoler, Department of Geography, San Diego State University, San Diego, CA, E-mail: stoler@rohan.sdsu.edu. Brendan C. Bain, University of the West Indies HIV/AIDS Response Programme (UWI HARP), Regional Coordinating Unit of the Caribbean HIV/AIDS Regional Training Network, Postgraduate Medical Education Building, University of the West Indies Office of the Vice Chancellor, University of the West Indies Mona, Kingston 7 Jamaica, E-mail: brendan.bain@uwimona.edu.jm. Madhav P. Bhatta, Department of Biostatistics, Environmental Health Science and Epidemiology, Kent State University, Kent, OH, E-mail: mbhatta@kent.edu. Trevor Castle, Ministry of Health, Kingston 6, Jamaica, E-mail: trevicastle@yahoo.com. Judith Harbertson, Military HIV Research Program, Naval Health Research Center, San Diego, CA, E-mail: judith.harbertson@med.navy.mil. Stephanie K. Brodine, Division of Epidemiology and Biostatistics, Graduate School of Public Health, San Diego State University, San Diego, CA, E-mail: sbrodine@mail.sdsu.edu. Sten H. Vermund, Institute for Global Health, Vanderbilt University School of Medicine, Nashville, TN, E-mail: sten.vermund@vanderbilt.edu.

REFERENCES

1. Auja S, 2009. *Enrollment in Global-Health Courses Doubled over the Past 3 Years, Survey Finds*. Chronicle of Higher Education. Available at: <http://chronicle.com/article/Enrollment-in-Global-Health/48394/>. Accessed October 15, 2009.
2. People's Health Movement, 2008. *Global Health Watch 2*. London: Zed Books Limited.
3. Institute of Medicine, 2009. *The U.S. Commitment to Global Health*. Washington, DC: The National Academies Press.
4. Beaty B, Marquardt M, 1996. *The Biology of Disease Vectors*. Niwot, CO: University of Colorado Press.
5. Garrett L, 2000. *Betrayal of Trust: The Collapse of Global Health*. New York: Hyperion.
6. Smolinski M, Hamburg M, Lederberg J, 2003. *Microbial Threats to Health: Emergence, Detection, and Response*. Washington, DC: National Academies Press.
7. Brewer CA, Berkowitz AR, Conrad PA, Porter J, Waterman M, 2008. Educating about infectious disease ecology. Ostfeld RS, Keesing F, Eviner VT, eds. *Infectious Disease Ecology*. Princeton, NJ: Princeton University Press, 448–466.
8. Gebbie K, Rosenstock L, Hernandez LM, eds, 2003. *Who Will Keep The Public Healthy? Educating Public Health Professionals for the 21st Century*. Washington, DC: National Academies Press.
9. UN Millennium Development Project, 2005. United Nations. Available at: www.unmillenniumproject.org/reports/goals_targetgets.htm. Accessed October 21, 2005.
10. Drain PK, Primack A, Hunt DD, Fawzi WW, Holmes KK, Gardner P, 2007. Global health in medical education: a call for more training and more opportunities. *Acad Med* 82: 226–230.
11. Freedman DO, Gotuzzo E, Seas C, Legua P, Plier DA, Vermund SH, Casebeer LL, 2002. Educational programs to enhance medical expertise in tropical diseases: the Gorgas Course experience 1996–2001. *Am J Trop Med Hyg* 66: 526–532.
12. Casebeer LL, Grimes J, Kristofco RE, Freeman B, Gotuzzo E, Freedman DO, 2001. Evaluation of the effectiveness of an international diploma course in tropical medicine. *J Contin Educ Health Prof* 21: 97–102.
13. Crump JA, Sugarman J, 2010. The Working Group on Ethics Guidelines for Global Health Training (WEIGHT). Ethics and best practice guidelines for training experiences in global health. *Am J Trop Med Hyg* 83: 1178–1182.
14. Kazura JW, Ripp J, Milhous WK, 2011. Back to the future: The American Society of Tropical Medicine and Hygiene, its journal and the continuing commitment to global health. *Am J Trop Med Hyg* 84: 3–4.

15. Webster-Kerr K, Peter Figueroa J, Weir PL, Lewis-Bell K, Baker E, Horner-Bryce J, Lewis-Fuller E, Bullock Ducasse M, Carter KH, Campbell-Forrester S, 2011. Success in controlling a major outbreak of malaria because of *Plasmodium falciparum* in Jamaica. *Trop Med Int Health* 16: 298–306.
16. Davis P, Mello N, 2003. Beyond study abroad: the value of international experiential education. *The International Educator* 12: 40–48.
17. Vermund SH, Audet CM, Martin MH, Heimburger DH, 2010. Training programmes in global health. *BMJ* 341: c6860.
18. Stoler J, Brodine SK, Bromfield S, Weeks JR, Scarlett HP, 2011. Exploring the relationships between dengue fever knowledge and *Aedes aegypti* breeding in St. Catherine Parish, Jamaica: a pilot of enhanced low-cost surveillance. *Res Rep Trop Med* 2: 93–103.
19. Minkler M, 2005. Community-based research partnerships: challenges and opportunities. *J Urban Health* 82 (Suppl 2): ii3–ii12.
20. Crump JA, Sugarman J, 2008. Ethical considerations for short-term experiences by trainees in global health. *JAMA* 300: 1456–1458.
21. Vermund SH, Sahasrabudde VV, Khedkr S, Jia Y, Etherington C, Vergara A, 2008. Building global health through a center-without-walls: the Vanderbilt Institute for Global Health. *Acad Med* 83: 154–164.
22. Madon T, Hofman KJ, Kupfer L, Glass RI, 2007. Implementation science. *Science* 318: 1728–1729.
23. Walker B, Barrett S, Polansky S, Galaz V, Folke C, Engstrom G, Ackerman F, Arrow K, Carpenter S, Chopra K, Daily G, Ehrlick P, Hughes T, Kautsky N, Levin S, Maler K-G, Shogren J, Vincent J, Xepapadeas T, de Zeeuw A, 2009. Looming global-scale failures and missing institutions. *Science* 325: 1345–1346.