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management + education + technology consulting

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Executive Summary

In response to the rapid increase in the worldwide incidence and prevalence of chronic noncommunicable diseases, the UnitedHealth Group (UHG) and the National Heart, Lung, and Blood Institute (NHLBI) formed a partnership to create the Global Health Initiative Collaborating Centers of Excellence Program (GHI COE Program). This program is a collaborative global network of centers of excellence (COEs) in low- and middle-income countries (LMIC) throughout the world.

The purpose of the Program is to combat noncommunicable chronic cardiovascular and pulmonary diseases (CVPD) in developing countries by supporting clinical research infrastructure development, research training, and research on new and improved approaches, programs, and measures to prevent or treat chronic CVPD. The Program is designed to develop research COEs with faculty and staff capable of conducting independent and/or collaborative research, and training future investigators at the doctoral and postdoctoral levels. It is expected to stimulate clinical, epidemiologic, health services and outcomes, health policy, translational, and behavioral research.

Each COE comprises a research center in a developing country partnered with at least one academic institution in a developed country. A total of 11 COEs are supported through this public-private partnership. NHLBI provides funding to nine of the COEs, six of which also receive funds from UHG. UHG is the sole funder of two additional COEs. The NHLBI also funds a centralized Administrative Coordinating Center (ACC) that provides administrative support for the overall Program.

A Steering Committee oversees and monitors Program activities. The Steering Committee membership includes (1) each COE Principal Investigator; (2) a representative from each of the COEs' developed country partners; (3) the NHLBI and UHG Project Officers; and (4) the Principal Investigator of the ACC. The Steering Committee meets quarterly, twice by phone and twice in person. One of the in-person meetings also includes a specialized training track that is attended by three trainees from each COE.

During year four of the Program's five-year term, the NHLBI engaged Humanitas, Inc., to conduct a feasibility study for an outcome evaluation of the Program. The study took place between September 2012 and March 2013.

1. Feasibility Study Purpose, Scope, and Methods

The study purpose was to inform the NHLBI about whether and how to move forward with planning and conducting an outcome evaluation. The feasibility study had four objectives:

1. *Develop study questions for an outcome evaluation of the NHLBI-UHG COE Program*

2. *Develop appropriate performance measures for an outcome evaluation, after considering populations and variables to study and the availability of prospective comparison groups*

3. *Assess the availability of archival data that could be used for the outcome evaluation, and identify the potential data sources and methods for collecting the data*

4. *Develop a plan for an outcome evaluation of the GHI COE Program*

The primary audiences for the feasibility study are NHLBI personnel responsible for management, planning, and evaluation of the GHI COE Program and personnel within other NIH components who are interested in global health research programs.

2. Study Results

The study generated the following planning materials for an outcome evaluation of the GHI COE Program:

- Documented consensus about the focus and objectives of outcome evaluations of performance, both at the end of the award period and at specified intervals after end of the award period

- A logic model for the Program

- Outcome evaluation study questions

- An evaluation framework positing standards, indices, and measures for assessing Program performance outcomes

- A summary of the availability of outcome data about the Program

- A Gantt chart showing tasks, deliverables, and schedule for evaluating outcomes from activities occurring during the award period

- A chart showing the estimated level of effort for staffing an evaluation of outcomes from activities occurring during the award period

3. Study Recommendations

Humanitas recommends that NHLBI consider sponsoring an outcome evaluation of the Program by the end of the award period. This approach offers a cost-effective opportunity to inform the evaluation's target audiences in a timely fashion about Program performance in attaining short-term outcomes. It leverages the availability of a standard set of comparable data about results of interest to the target audience; offers information about projects funded by both public and public/private entities; and, offers opportunities to collect currently unavailable information in relatively inexpensive and unobtrusive ways.

Humanitas suggests that the outcome evaluation focus on the nine federally funded projects. The federally funded projects can inform NIH target audiences about issues of interest to them in planning for future GHI COE efforts and for like global health initiatives. Standard sets of clean data about many aspects of Program performance are available. There is still time before the Program ends to collect data of interest that now are unavailable. This bodes well because the award period tends to be the time when additional data are most accessible and awardees are most willing and able to furnish them.

The evaluation of award period outcomes would comprise (1) Part One, a case study report that documents the achievements and lessons learned at each individual project site during the award period and (2) Part Two, a summary report about lessons learned across sites during the award period about how to achieve Program aims in diverse settings. This design recognizes that, although the programs at each site are not directly comparable because of differences in settings, cultures, and operating conditions, each offers lessons that can be useful to sponsors and administrators of biomedical research programs with similar attributes.

The Part One case studies of the nine federally funded projects would provide “vertical” descriptions of organization, setting, processes, outputs, and outcomes for each site. Each would follow the same format for a concise narrative with both qualitative and quantitative information about each project’s features and results. Part Two would be a single report that describes lessons learned by the Program and furnishes a “horizontal” analysis of similarities and differences across a variety of project settings and conditions. It would also include documentation of COE Program outcomes from analysis of archival and new quantitative and qualitative performance data.

The proposed evaluation approach would require collection of primary and secondary data from the ACC, from the COEs, and from NHLBI. UHG program administrators could also be asked to provide data. The final in-person Steering Committee meeting, which is scheduled to be held in Bethesda, MD, in the spring of 2014, offers evaluators a relatively cost-effective opportunity to collect primary qualitative data from key COE personnel and trainees.

The evaluation would take place over a 16-month project period that begins in September 2013. This schedule allows sufficient research and planning time in advance of the final

COE meeting in the spring of 2014, as well as sufficient time after the end of the COE projects' award period (and while the ACC is still in operation) to process and analyze data about final results. The estimated cost of the proposed project is approximately $300,000.

1. Introduction and Methodology

This report describes the purpose, methodology, findings, and recommendations of a feasibility study for evaluation of the outcomes of the UnitedHealth Group (UHG) and National Heart, Lung, and Blood Institute (NHLBI) Global Health Initiative Collaborating Centers of Excellence Program (GHI COE Program or the Program). Humanitas, Inc., conducted the study between September 2012 and March 2013.

The GHI COE Program was initiated in 2009 to address the global burden of chronic noncommunicable cardiovascular and pulmonary diseases (CVPD) in low- and middle-income countries (LMIC) throughout the world. A public-private partnership between NHLBI and the UHG, the GHI COE Program was intended to stimulate clinical, epidemiologic, health services and outcomes, health policy, translational, and behavioral research. Through a unique collaborative model, the GHI COE Program strives to attain these program objectives:

- Enable clinical research infrastructure development
- Enable research training
- Conduct research on new or improved approaches, programs, and measures to prevent or treat chronic cardiovascular and pulmonary disease

Each Center comprises a research center in a developing country partnered with at least one academic institution in a developed country. The arrangement is intended to enhance each Center's training and research opportunities and to facilitate the growth of its research capabilities. A centralized Administrative Coordinating Center (ACC), operated by Westat, Inc., provides administrative support for the overall Program.

Eleven COEs are supported through this public-private partnership. NHLBI provides funding to nine COEs, six of which also receive funds from UHG. UHG is the sole funder of two additional COEs. Exhibit 1-1 presents information about the GHI COE sites, developed country partners, and major funding agency(ies).

A Steering Committee oversees and monitors activities for the entire Program. The Steering Committee membership includes (1) each COE Principal Investigator; (2) a representative from each COE's developed country partners; (3) the NHLBI and UHG Project Officers; and (4) the Principal Investigator of the ACC. The Steering Committee meets quarterly. It holds two, in-person meetings per year, one in the autumn in Bethesda, MD, and the other in the spring in a foreign country. The autumn meeting includes a specialized training track that is attended by three trainees from each COE. The other two Steering Committee meetings are convened by conference call.

The NHLBI is interested in exploring the feasibility of conducting an outcome evaluation of the GHI COE Program that may also include some process elements. NIH personnel

responsible for management, planning, and evaluation of the GHI COE Program and personnel within other NIH components who are interested in global health research programs are the primary audiences for this study.

Exhibit 1-1. GHI COE Sites, Partners, and Funding Agencies

Centers and Their Partners		Funding Agency(ies)		
Center Name and Location	**Partner Name and Location**	**NHLBI**	**UHG**	**NHLBI & UHG**
Argentina: South American Center for Cardiovascular Health, Institute for Clinical Effectiveness and Health Policy, Buenos Aires	Tulane University School of Public Health and Tropical Medicine, New Orleans, LA, USA	✓		
Bangladesh: International Centre for Diarrhoeal Disease Research, Dhaka	Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD, USA			✓
China: The George Institute, Beijing	Duke Global Health Institute, Durham, NC, USA			✓
Guatemala: Institute of Nutrition of Central America and Panama (INCAP), Guatemala City	Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD, USA			✓
India (Bangalore): St. John's Research Institute, Bangalore, Karnataka	Population Health Research Institute, Hamilton Health Sciences and McMaster University, Hamilton, Ontario, Canada			✓
India (New Delhi): Public Health Foundation of India, New Delhi	Emory University, Atlanta, GA, USA			✓
Kenya: Moi University, School of Medicine, Eldoret	Duke University Medical Center, Durham, NC, USA	✓		
Mexico: Center for Health Promotion of Northern Mexico, Hermosillo	University of Arizona, Mel & Enid Zuckerman College of Public Health, Tucson, AZ., USA		✓	
Peru: Universidad Peruana Cayetano Heredia, Lima	Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD, USA	✓		
South Africa: University of Cape Town, Cape Town	Harvard Medical School, Brigham and Women's Hospital, Boston, MA, USA			✓
Tunisia: University Hospital Farhat Hached, Sousse	Department of Chronic Disease Prevention and Health Promotion, National Public Health Institute of Helsinki, KTL, Finland		✓	

1.1. Study Purpose

The NHLBI sponsored this feasibility study to assist in determining whether and how to move forward with planning and conducting an outcome evaluation. The feasibility study had four objectives:

1. *Develop study questions for an outcome evaluation of the NHLBI-UHG COE Program*

2. *Develop appropriate performance measures for an outcome evaluation, after considering populations and variables to study and the availability of prospective comparison groups*

3. *Assess the availability of archival data that could be used for the outcome evaluation, and identify the potential data sources and methods for collecting the data*

4. *Develop a plan for an outcome evaluation of the GHI COE Program*

1.2 Study Methodology

Project work began with a meeting at which the Humanitas study team and NHLBI personnel discussed the project requirements. At that session, the study team confirmed the project schedule, discussed features of the final work plan, and confirmed that for this feasibility study NHLBI desired that there be no effort to collect new data. Humanitas followed up that meeting and all subsequent meetings with a written summary for approval by the Contracting Officer's Representative (COR) before proceeding to the next step.

After receiving approval for a Work Plan and schedule from the COR, the study team performed each contract task. Task 2, Report to the COR, featured weekly meetings of the study team with the COR, by phone or in person, to discuss project progress, pending issues, and next steps. The weekly meetings were also a forum for the COR to provide feedback and direction on milestones and deliverables submitted to the COR.

Conducting Background Research. First, Humanitas obtained, assessed, and documented the literature, reviewing 59 publications apparently relevant to study topics suggested by project sponsors (performance metrics already used, potential future metrics, evaluation methods, and potential comparison groups). For those 43 publications deemed to offer relevant insights, we abstracted the appropriate data elements in the approved record format, indexed each article by assigning key terms, and analyzed the data. Humanitas submitted findings in draft form to the COR, made revisions in response to review comments provided by the COR, and then submitted the Literature Review Report in final form, as shown by Appendix A.

Programs identified through the literature review as possible comparison groups were then examined in more detail to determine their suitability for inclusion in an evaluation. This analysis considered key scientific elements of each potentially comparable program (i.e., disease/condition focus, chronic noncommunicable v. infectious disease, type of research, levels of training supported) and structural elements of each program (i.e., program status, funding level, funding mechanism, whether funds are awarded directly to foreign institutions, whether the program is a public-private partnership, and whether the program supports one or more research centers). The analysis also considered the extent to which available evaluation data could be identified.

Humanitas studied the characteristics of the COE Program, overall and by awardee project, and investigated special considerations that could affect evaluation design. Eleven COEs are supported through this public-private partnership. Key characteristics of each COE are summarized in Appendix B. NHLBI also supported collaborative research between Centers through a competitive awards process for supplemental grant funds. Appendix C summarizes the partners and projects catalyzed through this process.

Humanitas also developed an inventory of similar programs that might be candidates to serve as comparison groups in an evaluation study. The study team interviewed Fogarty International Center evaluation staff to validate and buttress its findings from archival data about global health research and training program evaluation. Humanitas also studied and confirmed with NHLBI program and evaluation officials the potential influence on outcome evaluation of several unusual features of the COE Program of particular interest to NHLBI--a contract funding mechanism, awarding funds directly to foreign institutions, public-private funding arrangements, and development of a collaborative research network.

Humanitas prepared three products that summarized the background research: (1) a narrative overview of the entire COE Program that describes its purpose, background, structure, and operation, (2) a matrix documenting characteristics of each individual Center of Excellence project, such as location, partners, and training offered, and (3) a memorandum about the implications of features of special interest to NHLBI.

Planning an Outcome Evaluation. Humanitas then turned to the task of planning an outcome evaluation. The first steps were to develop measurable, time-phased goals and objectives for the GHI COE Program and an updated logic model showing how the program is intended to operate and incorporating program features of special interest to NHLBI.

Humanitas next considered the issues of how to organize and implement an outcome evaluation to best meet the information needs of the target audience. This phase began with development of study questions based on consideration of Program objectives, processes identified in the logic model, and NHLBI priorities. For each study question, Humanitas noted possible performance measures, as well as populations and objects to be studied.

Having gained an understanding of COE Program intent, populations, and variables to be studied and investigated potential comparison programs, the study team next addressed the issue of how to assess performance. No formal documentation of Program outcome performance assessment plans and metrics was available. Humanitas requested and received permission from the COR to develop a draft performance assessment plan in the form of an Evaluation Framework for the GHI COE Program. The Framework guides performance assessment by positing standards and indices that describe NHLBI performance expectations and linking them to measures of performance that describe precisely how well each project is doing in attaining its aims. To determine overall Program performance, the evaluator can describe ranges of performance for all projects

studied and, when appropriate, calculate performance means and averages for the Program as a whole.

The study team's next task was to assess data availability. To do so, the team determined which data required by the performance assessment plan are available, where they are available, and whether they are accessible. For required data that are not currently available, the team assessed whether they could be obtained and how they could be obtained most economically. The study team catalogued the data requirements for each performance measure in the Framework, noting which data are available, the data source, data limitations, and suggestions about how to collect new data. Humanitas analyzed data availability without access to the COE Performance Database or completed COE Data Collection Instruments, so there may be some differences between expected and actual data availability, completeness, and quality.

Humanitas then developed a recommended strategy for an outcome evaluation. To develop the strategy, the study team's foremost consideration was how best to meet the information needs of the target audience, given data availability, accessibility, and quality considerations. Humanitas met with the COR and the Program Director to discuss the recommended strategy's rationale and features. The study team then prepared draft and final versions of the feasibility study.

2. Findings

This section describes results that relate to the first three study objectives:

1. *Develop study questions for an outcome evaluation of the NHLBI-UHG COE Program*

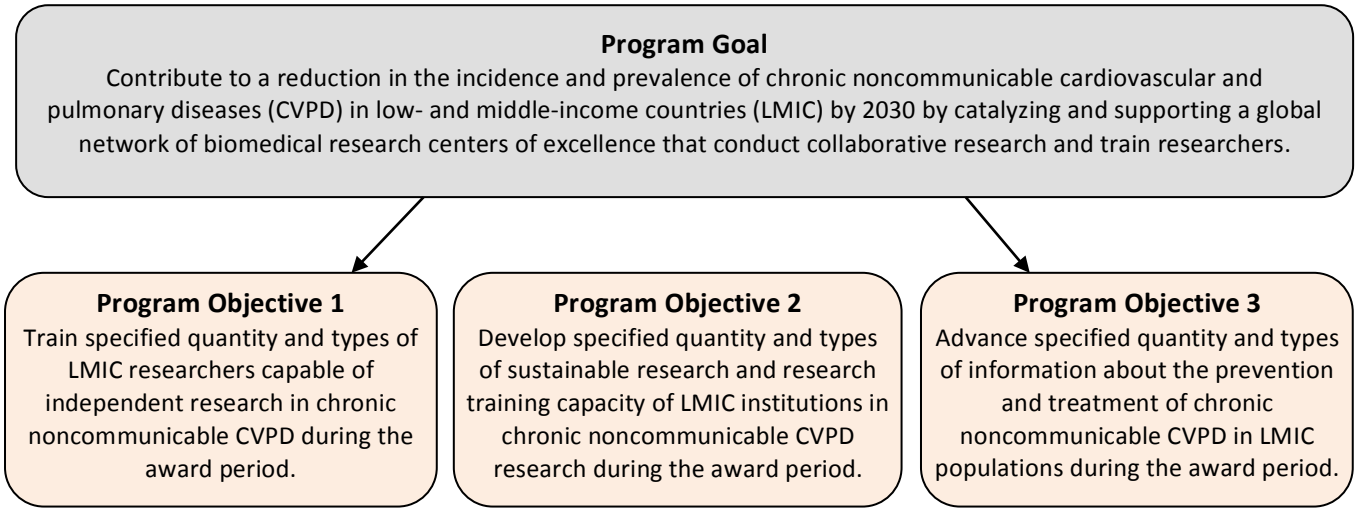
2. *Develop appropriate performance measures for an outcome evaluation, including consideration of populations and variables to study, and the availability of prospective comparison groups*

3. *Assess the availability of archival data that could be used for the outcome evaluation, and identify potential data sources and data collection methods if needed*

2.1 Study Questions

To develop study questions for an outcome evaluation, the study team first sought to develop consensus among informants about the timing and measurement of the Program goal and objectives. As shown in Exhibit 2-1, Program documents and interviews with NHLBI staff indicated that the intended Program long-term outcome goal is to contribute to a reduction in the incidence and prevalence of chronic CVPD in the LMIC where the COEs conduct research. The study team proposed that this should occur by 2030 to coincide with benchmarks established by the World Health Organization for chronic CVPD. As also shown by Exhibit 2-1, the agreed-upon objectives focus on attainment during the award period of three functions: training researchers, developing sustainable research and research training capacity, and advancing the science in CVPD.

Exhibit 2-1. GHI COE Program Goals and Objectives[1]



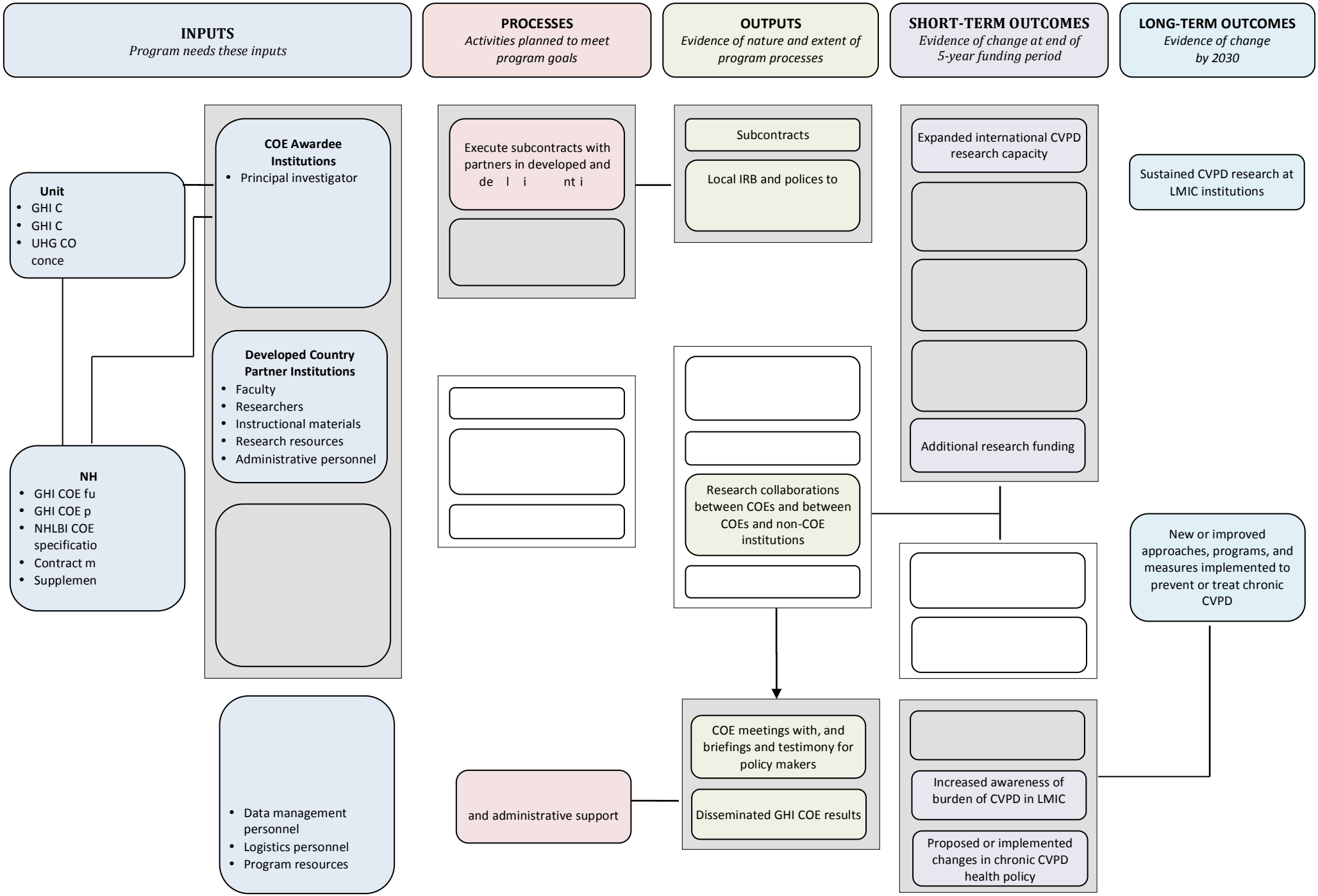
[1] Sources: RFP No: BAA-NHLBI-HV-09-12, *Global Health Activities in Developing Countries to Combat Non- Communicable Chronic Cardiovascular and Pulmonary Diseases (CVPD) - Centers of Excellence*, Issued September 25, 2008.

GSA Contract No: GS-00F-0024M, *NHLBI Global Health Initiative Evaluation Feasibility Study*, September 20, 2012.

The next step was to develop a logic model that would document how the GHI COE Program is intended to operate to achieve its goal and objectives, and specify planned linkages for the inputs, processes, outputs, and short- and long-term outcomes for the Program. The Logic Model shown in Exhibit 2-2 on page 2-3 captures both the intended roles and relationships of Program participants and the features of the GHI COE Program that are of special interest to study sponsors. In summary, the GHI COE Program is intended to work in this manner:

- NHLBI and UHG fund LMIC institutions to execute the Program
- Foreign awardee institutions subcontract with developed country partners and collaborate with LMIC partners on project activities
- Each project conducts CVPD research, research training, capacity-building, and information dissemination activities
- During the award period, each project generates outputs and attains outcomes required to achieve each of the three Program objectives
- At specified time intervals after the award period, each project can report that it is attaining Program objectives and producing longer-term outcomes to continue to achieve the Program goal.

Exhibit 2-2. Logic Model for GHI COE Program



The goals and objectives and the program logic model informed development of seven study questions that could be used for an outcome evaluation of the Program:

1. *To what extent did the program train LMIC researchers capable of independent research in chronic, noncommunicable CVPD during the award period?*

2. *To what extent did the program develop sustainable research and research training capacity of LMIC institutions in chronic, noncommunicable CVPD research during the award period?*

3. *To what extent did the program facilitate global health research collaborations featuring LMIC institutions?*

4. *To what extent did the program advance scientific knowledge about the prevention and treatment of chronic, noncommunicable CVPD during the award period?*

5. *What public health policy changes can be attributed to research findings from the program?*

6. *What program administration, design, and management lessons does the program provide to NIH program administrators?*

7. *What long-term effects of the program may merit further study at a later date?*

2.2 Performance Measures

To develop performance measures, the study team began by identifying and characterizing populations, objects, and important variables necessary to answer the study questions during an outcome evaluation. The team also sought to determine whether comparison measures could be obtained from other global health research programs.

Populations, Objects, and Important Variables. Review of study questions enabled the study team to identify and characterize the populations, objects, and important variables to be studied in the outcome evaluation.

- Populations to be studied include key personnel for each COE, NIH program officials and contract administration staff, all current and former trainees of the COEs, and possibly UHG program officials. Objects to be studied include each COE and the ACC.

- Important variables to be studied include the unusual features of the COE Program of particular interest to NHLBI—a contract funding mechanism, awarding funds directly to foreign institutions, public-private funding arrangements, and development of a collaborative research network. Other variables of interest include Program activities and outputs that may yield unexpected outcomes not

normally investigated in evaluations, and Program processes, to inform decisions about including process measures in an evaluation.

Observations about the implications of the unusual Program features are summarized in Exhibit 2-3 on the next page and discussed below. The implications all appear to be most important to consider in assessing attainment of intermediate outcomes at the end of the award period, rather than long-term outcomes at later intervals until 2030.

- The contract funding mechanism promotes the availability of high quality standard data sets about process outputs and intermediate outcomes. Projects are mandated to provide standard data sets about outcomes at routine intervals to the ACC.

- Awards to foreign institutions impact both the nature and availability of evaluation data. Variations in program design and operating conditions across sites affects which specific data elements are expected to be reported and the rate of progress in attaining project aims.

- Public-private partnerships theoretically offer the potential to study outcomes of three GHI COE Program funding models—projects that are funded by public entities only, by both public and private entities, and by private entities only. In practice, the study team was not successful in learning about the process or outcome data collection and reporting practices of either site funded only by UHG.

- Research network model mandates collaboration among projects and participants in planning Program initiatives and disseminating information about results. The ACC serves as the coordinator of this collaboration—convening meetings and conference calls and serving as a single point of contact for the collection, management, and dissemination of a high quality set of data about the GHI COE Program network's six publicly-funded and three publicly/privately funded-projects.

Exhibit 2-3. Implications of Unusual Program Features for Evaluation of Program Performance

Program Feature	Unique Quality	Implications for Evaluation of Program Performance
Contract funding mechanism	Greater NHLBI legal and financial control of process and results to be delivered as compared to grant mechanism	NHLBI influences availability and accessibility of Program performance data during the award period
Awards to foreign institutions	Out -of-country project administration	Project performance at foreign institutions must meet US regulatory standards during the award period
Public-private partnerships	Three different contract models 1. Public 2. Private 3. Public-private	Data collection and reporting requirements during the award period (1) for models 1 and 3 are known to be identical and (2) for model 2 are said to be different.
Research network model	• In-person and teleconference meetings • Single point of contact for data collection, management, reporting • Cross-project, multinational research collaborations	ACC data management during the award period assures availability of high quality, standard data about evaluation outcomes from projects that receive federal funds. Quarterly meetings during the award period offer access to all awardee participants who receive NHLBI funds.

Availability of Comparison Groups. The study team attempted to identify programs that are comparable in purpose, structure, and participants to the GHI COE Program. Building on the literature review findings and input from NIH personnel, the team studied 20 candidate programs to determine the extent to which individual programs had comparable key characteristics to the UHG COE and could be expected to have secondary data available to inform assessment of program performance.

Not surprisingly, given its unique features and diverse set of projects, no ideal comparison group could be found for the GHI COE Program. *The Health Research Capacity Strengthening Initiative: Kenya and Malawi*; and, the *Netherlands African Partnership for Capacity Development and Clinical Interventions against Poverty-related Diseases* are unsuitable for comparison but are the best available candidates for a comparison because they are relatively current, fund research centers, are public-private partnerships, and award funds directly to foreign governments. Neither were funded by contract or established a research network, nor did they focus on chronic, noncommunicable disease research.

Similarly, the lack of comparable programs resulted in a limited array of tested methods and metrics for possible use in an evaluation of the GHI COE Program. The tested metrics

tend to be conventional measures of biomedical research processes and outputs, like those typically collected for NIH programs. There is also a paucity of actual results, tools, and experience with evaluation of biomedical research and training collaborations between developed and developing countries, since evaluation has not always been a priority for global health research programs to date.

Performance Measures. The target populations, variables, and search for potential comparison measures informed the development of an Evaluation Framework for the GHI COE Program. The Evaluation Framework shown in Appendix D serves as a guide for assessing the nature and degree of attainment of each Program objective, and ultimately, of the Program goal.

- For each of the three Program objectives, the Framework specifies performance standards that NHLBI can use to assess degree of performance objective attainment. Degree of attainment is specified by descriptive words, such as "most" and "all."

- For each performance standard, the Framework specifies one or more indices—numeric values that can be used to quantify level of attainment. Level of attainment is described by a number, such as "95%" or "10."

- For each performance index, the Framework specifies one or more performance measure(s) that NHLBI can use to calculate index attainment. Each performance measure shows what data need to be collected and how they should be processed. The result can be compared to the standard to assess how well the Program is doing in relation to stated expectations.

The Evaluation Framework developed for this feasibility study is a preliminary planning tool that served as a valuable guide for conducting the feasibility study. The study team used the Framework to develop and organize performance measures, assess the utility of available archival data, and determine whether new data collection should be recommended. The COR and the GHI COE Program Director approved the type of standards, indices, and measures prepared for this feasibility study. However, the feasibility study schedule did not allow time for NHLBI to develop actual performance standards and indices for the GHI COEs. Should NHLBI decide to conduct an outcome evaluation, NHLBI stakeholders will need to review and update the Framework presented in this document.

The performance measures identified for the GHI COE Program are presented below by topic.

<u>Training Outcomes</u>
- *Training completion rates*
- *Trainee degrees earned*
- *Non-degree credentials earned by trainees*

Career Paths and Locations of Former Trainees

- *Former trainees who embark on career in CVPD research*
- *Former trainees who work in CVPD field five years after training*
- *Former trainees who remain in/leave/return to developing countries for careers*

Evidence of Academic Research Skills of Postdoctoral Trainees

- *Postdoc trainee publications*
- *Postdoc trainee presentations*
- *Postdocs who submit applications or earn research funding*
- *Postdocs with scientific achievements other than publications and presentations*

Capacity-building Outcomes

- *COE compliance with NIH research policies*
- *COE faculty and research support staff*
- *IRB approval of additional research projects*
- *Funding secured for additional research projects*
- *Ability to recruit and retain trainees*
- *Sufficiency of curricula offered*
- *Quality of mentoring (if offered)*

Collaborative Research Outcomes

Extent of collaborative research

Scientific and Policy Effects

- *COE research publications and presentations during the award period*
- *COE publications and presentation within five years of award period*
- *Citations of COE research publications with five and ten years of award period*
- *Media coverage of COE research*
- *COE contributions to health policy development*
- *CVPD policy changes proposed, enacted, or implemented*

Unexpected Outcomes

Nature and extent of unexpected outcomes for each area of program focus (research training, research capacity, research training capacity, and scientific advances), as well as aspects of program design, administration, or management

Exhibit 2-4, Relationship of Study Questions to Program Objectives and Performance Measures, shows how the performance measures relate to program objectives and answer the study questions.

Exhibit 2-4. Relationship of Study Questions to Program Objectives and Performance Measures

Program Objective	Study Questions	Performance Measures
1. Train specified quantity and types of LMIC researchers capable of independent research in chronic noncommunicable CVPD during the award period.	1. To what extent did the program train LMIC researchers capable of independent research in chronic, noncommunicable CVPD during the award period?	• Training completion rates • Trainee degrees earned • Postdoc trainee publications • Postdoc trainee presentations • Non-degree credentials earned by trainees • Postdocs who submit applications or earn research funding • Postdocs with scientific achievements other than publications and presentations
2. Develop specified quantity and types of sustainable research and research training capacity of LMIC institutions in chronic noncommunicable CVPD research during the award period.	2. To what extent did the program develop sustainable research and research training capacity of LMIC institutions in chronic, noncommunicable CVPD research during the award period?	• COE compliance with NIH research policies • COE faculty and research support staff • IRB approval of additional research projects • Funding secured for additional research projects • Ability to recruit trainees • Ability to retain trainees • Sufficiency of curricula offered • Quality of mentoring (if offered)
	3. To what extent did the program facilitate global health research collaborations featuring LMIC institutions?	Extent of collaborative research
3. Advance specified quantity and types of information about the prevention and treatment of chronic noncommunicable CVPD during the award period.	4. To what extent did the program advance scientific knowledge about the prevention and treatment of chronic, noncommunicable CVPD during the award period?	• COE research publications • COE research presentations
	5. What public health policy changes can be attributed to research findings from the program?	• Media coverage of COE research • Health policy changes • COE contributions to health policy development
All objectives	6. What program administration, design, and management lessons does the program provide to NIH program administrators?	Lessons learned and unexpected outcomes for each area of program focus (research training, research capacity, research training capacity, and scientific advances), as well as aspects of program design, administration, or management.
	7. What long-term impacts of the program may merit further study at a later date?	• Former trainees who embark on career in CVPD research • Former trainees who work in CVPD field after five years • Former trainees who remain in/leave/return to developing countries for careers • COE publications within five years of award period • Citations of COE research publications with five and ten years of award period

2.3 Availability of Data for an Outcome Evaluation

The next three study aims relate to the assessment of the availability and quality of data available to evaluate NHLBI-UHG Centers of Excellence Program.

- *Identify archival data sources that could be used for the outcome evaluation.*

- *Inventory and describe archival data.*

- *Determine whether new data are needed and, if so, identify potential data sources and data collection methods.*

The study team reviewed archival sources of data about the Program to determine their utility in an outcome evaluation. Data sources and findings are summarized in the next series of bulleted items.

- *COE Performance Database*. The principal sources of secondary data about Program performance are Data Collection Instruments (DCIs) and associated subforms that are completed and submitted by the NHLBI-funded COEs to the ACC website twice a year. Through this reporting mechanism, NHLBI collects specified output and outcome data for the COEs (including COE Progress Reports). To provide NHLBI with valid outcomes data, the ACC cleans the submitted DCI data and maintains them in the COE Performance Database. NHLBI contracted with the ACC for an additional year after the conclusion of the COE Program, so that performance data from the full Program period could be collected, cleaned, and analyzed.

- *ACC Progress Reports*. Annual and semi-annual program summary reports and graphs prepared by the ACC for NHLBI (1) describe DCI data that have been cleaned and analyzed, and (2) offer narrative explanations and additional context.

- *COE Process Evaluation*. A process evaluation of the COE Program completed for NHLBI by Westat, Inc., and Matrix Public Health Solutions in 2011 includes (1) DCI data that have been cleaned and analyzed, and (2) additional qualitative data collected through interviews of key informants. (The available archival data at the time of the Process Evaluation are summarized in Appendix B of that report.)

- *Records*. Additional available sources, such as COE Network Committee and Subcommittee notes, offer qualitative data about Program activities and issues. They do not provide systematically reported or comparable data across project sites, but they could provide qualitative insights or context for interpreting secondary data.

The most useful source of evaluation data will be the COE Performance Database, which contains the required reporting elements from the COEs. In general, these data are traditional outputs for NIH research and research training programs, including trainee

characteristics and completion, degrees offered, publications and presentations, additional research project and funding secured, and institutional capacity and compliance with NIH research regulations. As required by NIH, the data also report media coverage and policy changes in GHI COE regions related to CVPD research. The data are expected to describe outcomes for the full award period, but not after the award period.

Four types of data needed to answer study questions are not available from archival sources. The bullet points that follow both identify these missing data categories and also suggest methods for collecting new primary data for an outcome evaluation.

- *Unexpected short-term outcomes* related to all aspects of the GHI COE Program (Measures 1.F, 2.I, 2.J, and 3.D). Data about unexpected short-term outcomes, lessons learned, and the effects of Program features of interest, could be collected from personnel at each site. Online, telephone, or in-person collection methods could be feasible. A good opportunity to collect information in person may be the final Spring 2014 GHI COE meeting in the Washington, D.C. area. All COEs will send key personnel to the meeting, including Principal Investigators, Developed Country partners, and COE trainees.

- *Long-term outcomes about career paths and location of former trainees* (Measures 1.B, 1.C, 1.D) or scientific impact of COE research publications (Measures 3.B.1 and 3.B.2.). Data about long-term outcomes, such as career paths for former trainees or publications after the award period, could be collected at one or more time intervals after the Pend, if desired. NHLBI could choose from several possible methods, depending upon the metric of interest. For example, for career path information, NHLBI could survey COE PIs (who may maintain professional contact with former trainees), or search publication indices and other Internet sources for data of interest. Practical issues associated with such data collection vary, depending on the approach selected, but could include: gaining the cooperation of former PIs, securing current contact information for former trainees, and the ease of locating different types of former trainees (such as postdocs v. community health workers).

- *Metrics not collected through the DCIs*, specifically, credentials earned by trainees other than degrees (Measure 1.A.2.2), extent to which postdocs pursue or earn research funding or other scientific achievements (Measures 1.E.3 and 1.E.4.), nature of COE research training curricula (Measure 2.F.), extent to which faculty engage trainees in their research (Measure 2.G), and contributions of COEs to policy development (Measure 3.C.2.1.). Data for metrics that were not included in the design of the DCIs could be collected from the COEs at or before the end of the program, if they are deemed priorities for NIH.

- *Performance of COEs funded by UHG*. Limited information is available about the COE sites that are solely funded by UHG. They are not required to report to the ACC, and do not do so. No secondary data about their outputs and outcomes could be found. Any data about their outputs and outcomes that are comparable to the data

collected by the ACC would require additional data collection. Collecting new data would require securing cooperation from the sites and possibly from UHG as well. It is not certain that gaining their cooperation would be possible, even with the assistance of NHLBI administrators and policy makers. Moreover, they may not be able to generate comparable data even if they were willing to cooperate.

In summary, review of expected data indicates that yields the following findings about availability of data needed to answer study questions:

- Data are available to answer Study Questions 3 and 4 about Program success in stimulating collaborative research and advancing the science during the award period.

- Data are available to answer Study Questions 1, 2, and 5 about training, capacity building, and policy changes during the award period. Collecting new primary data during the award period would enable evaluators to provide more fully informed answers to these questions.

- Primary data must be collected to answer Study Question 6 about lessons learned during the award period.

- Data are neither available nor accessible during the award period to answer Study Question 7 about long-term, post award outcomes in career paths and scientific impact of former trainees (part of Study Questions 1 and 3).

Exhibit 2-5, Summary of Data Availability to Answer Study Questions, on page 21, summarizes findings regarding the availability of archival data and gaps by study question. A report on data availability for each individual performance measure is shown in Appendix E, Availability of Archival Data about Evaluation Framework Performance Measures.

Exhibit 2-5. Summary of Data Availability to Answer Study Questions

Study Questions	Outcome Being Measured	Extent of Data Availability
1. To what extent did the program train LMIC researchers capable of independent research in chronic, noncommunicable CVPD during the award period?	Training completion rates Trainee degrees earned Postdoc trainee publications Postdoc trainee presentations	Available
	Non-degree credentials earned by trainees Postdocs who submit applications or earn research funding Postdocs with scientific achievements other than publications and presentations	Not available
2. To what extent did the Pdevelop sustainable research and research training capacity of LMIC institutions in chronic, noncommunicable CVPD research during the award period?	COE compliance with NIH research policies COE faculty and research support staff IRB approval of additional research projects Funding secured for additional research projects Ability to recruit trainees Ability to retain trainees	Available
	Sufficiency of curricula offered Quality of mentoring (if offered)	Not available
3. To what extent did the program facilitate global health research collaborations featuring LMIC institutions?	Extent of collaborative research	Available
4. To what extent did the program advance scientific knowledge about the prevention and treatment of chronic, noncommunicable CVPD during the award period?	COE research publications COE research presentations	Available
5. What public health policy changes can be attributed to research findings from the program?	Media coverage of COE research Health policy changes	Available
	COE contributions to health policy development	Not available
6. What program administration, design, and management lessons does the program provide to NIH program administrators?	Lessons learned and unexpected outcomes for each area of program focus (research training, research capacity, research training capacity, and scientific advances), as well as aspects of program design, administration, or management.	Not available
7. What long-term impacts of the program may merit further study at a later date?	Former trainees who embark on career in CVPD research Former trainees who work in CVPD field after five years Former trainees who remain in/leave/return to developing countries for careers COE publications within five years of award period Citations of COE research publications with five and ten years of award period	Not available

3. Recommendations

This chapter addresses the final project objective by presenting a *plan for an outcome evaluation of the GHI COE Program* that factors in findings about Program intent and characteristics that are presented in the previous chapter. The chapter begins with a section that describes the purpose and nature of the proposed evaluation. Subsequent sections present a suggested technical plan and schedule and a cost estimate.

3.1 Description of Outcome Evaluation

Humanitas recommends that NHLBI consider sponsoring an outcome evaluation of the Program at the end of the award period. This approach offers a cost-effective opportunity to inform the evaluation's target audiences in a timely fashion about Program performance in attaining short-term outcomes. It leverages the availability of a standard set of comparable data about most results of interest to the target audience; offers information about projects funded by both public and public/private entities; and, offers opportunities to collect currently unavailable information in relatively inexpensive and unobtrusive ways.

Humanitas suggests that the outcome evaluation focus on the nine federally funded projects. The federally funded projects are most likely to inform NIH target audiences about issues of highest interest to them in planning for future GHI COE efforts and for like global health initiatives. Standard sets of clean data about many issues of interest are available about performance of these projects. There is still time before the Program ends to collect data of interest that now are unavailable. This bodes well because the award period tends to be the time when additional data are most accessible and awardees are most willing and able to furnish it.

The recommended approach recognizes that the Program's diverse NIH-funded projects are not directly comparable but offer rich experience in lessons learned. It supplements the Program's standard sets of ACC-generated data about each project's outcome with qualitative information about building capacity to attain desired results in nine different settings. Qualitative information about the influences of the GHI COE Program's unusual features are likely to offer new and interesting insights about how to meet the challenges of building capacity in diverse research and training settings in the US and abroad.

The evaluation of award period outcomes would comprise (1) Part One, a case study report that documents the achievements and lessons learned at each individual project site during the award period and (2) Part Two, a summary report about lessons learned across sites during the award period about how to achieve Program aims in diverse settings. The evaluation would include discussion of the GHI COE Program's special features of interest to the target audience.

The Part One individual case studies of the nine federally funded projects would provide "vertical" descriptions of organization, setting, processes, outputs, and outcomes for each

site. Each would follow the same format for a concise narrative with both qualitative and quantitative information about each project's features and results. The case studies could serve as "how to" guides that benefit those who want to establish programs with similar aims in similar operating conditions; could be useful marketing handouts for the COEs to use in attracting additional funding and media coverage; and, could inform NIH policy makers and practitioners about operational issues that are relevant to planning both global and domestic biomedical research and training programs.

Part Two would be a single report that describes lessons learned by the Program and furnishes a "horizontal" analysis of similarities and differences across a variety of project settings and conditions. It would also include documentation of COE Program outcomes from analysis of archival and new quantitative and qualitative performance data. These analyses would be particularly useful to NIH administrators and policy makers in planning and assessing the results of grant programs with diverse operating conditions and challenges.

The proposed evaluation approach would require collection of primary and secondary data from the ACC, the COEs, NHLBI, and possibly from UHG program administrators as well. The final in-person Steering Committee meeting, which is currently scheduled to be held in Bethesda, MD, in the spring of 2014, offers evaluators a relatively cost-effective opportunity to collect primary qualitative data from key COE personnel and trainees. While projects are to be completed by June 2014, the ACC contract will not end until June 2015.

No OMB Privacy Act clearance would be required if the proposed study sample of fewer than 10 entities were to be asked the same evaluation questions. Data collection could be designed to ensure that the same questions about lessons learned would be asked of no more than one type of representative (administrator, researcher, trainer, trainee) from each of the nine sites. For the ACC data, no additional clearances should be required since the data are already archived.

3.2 Suggested Technical Approach

The evaluation would take place over a 16-month project period that begins in September 2013. This schedule allows sufficient research and planning time in advance of the final COE meeting in the spring of 2014, as well as sufficient time after the end of the COE projects' award period (and while the ACC is still in operation) to process and analyze data about final results.

Exhibit 3-1, Proposed GHI COE Outcome Evaluation Tasks, Deliverables, and Schedule, presents a Gantt chart for an outcome evaluation consistent with the general approach described in Section 3.1. Project tasks would include planning, data collection, case study preparation, and reporting, in addition to ongoing project administration activities. If obtaining final outcomes data from the COEs would require additional time for cleaning and production by the ACC, then additional time may be required at the conclusion of the project period.

3.3 Estimated Costs

The estimated total cost of the GHI COE Program outcome evaluation described in this chapter is $300,000. The main cost item would be project labor. Exhibit 3-2 is a proposed level of effort chart for the award period outcome evaluation described in this chapter. Labor costs were estimated on the basis of employing a senior-level corporate official as Project Director, a senior-level evaluator as Project Manager, and a mid-level evaluator as Research Associate.

Other direct costs associated with the project are nominal expenditures for local travel, supplies, and telephone. The estimate assumes that no expenses would be incurred by the evaluation in obtaining requested, cleaned outcome data or graphs from the ACC.

Exhibit 3-1
Proposed GHI COE Outcome Evaluation Tasks, Deliverables, and Schedule

	Months After Contract Start															
	2013				2014											

Item Number	Task	Sept 1	Oct 2	Nov 3	Dec 4	Jan 5	Feb 6	Mar 7	Apr 8	May 9	Jun 10	July 11	Aug 12	Sept 13	Oct 14	Nov 15	Dec 16
1.0	**Administer Project**																
1.1	Meet with Project Officer	1															
1.2	Develop Work Plan		2														
1.3	Report on Progress		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2.0	**Develop Data Collection and Analysis Plan**																
2.1	Identify study sample																
2.2	Develop data collection formats			4													
2.3	Develop data collection schedules			4													
2.4	Develop data analysis plan			4													
2.5	Develop data analysis schedule			4													
3.0	**Collect Data**																
3.1	Collect available data from ACC																
3.2	Collect new data from COEs																
4.0	**Prepare Case Studies**																
4.1	Prepare draft case studies						5A										
4.2	Prepare final case studies										5B						
5.0	**Prepare Analysis Report**																
5.1	Prepare draft analysis report														6A		
5.2	Prepare final analysis report															6B	
5.3	Convene oral briefing on analysis findings																7

LIST OF DELIVERABLES

ITEM	DUE DATE
1 Kickoff Meeting	Within 5 days of project start
2 Work Plan	Within 1 month of project start
3 Monthly Progress Report	By the 20th day of months 2/18
4 Data Collection and Analysis Plan	By the end of month 3
5A Draft Case Studies	By the end of month 8
5B Final Case Studies	By the end of month 12
6A Draft Analysis Report	By the end of month 16
6B Final analysis report	By the end of month 17
7 Oral Briefing on Analysis Findings	By the end of month 18

Exhibit 3-2
Proposed Level of Effort for GHI COE Outcome Evaluation

Item Number	Task	Labor Hours/ Project Director	Labor Hours/ Project Manager	Labor Hours/ Research Associate	Total
1.0	**Administer Project**				
1.1	Meet with Project Officer	30	30	30	90
1.2	Develop Work Plan	8	40	24	72
1.3	Report on Progress	6	18	18	42
	Subtotal, Task 1	44	88	72	204
2.0	**Develop Data Collection and Analysis Plan**				
2.1	Identify study sample	4	16	8	28
2.2	Develop data collection formats	4	40	40	84
2.3	Develop data collection schedules	1	4	0	5
2.4	Develop data analysis plan	8	40	8	56
2.5	Develop data analysis schedule	1	4	0	5
	Subtotal, Task 2	18	104	56	178
3.0	**Collect Data**				
3.1	Collect available data from ACC	4	40	80	124
3.2	Collect new data from programs	24	40	60	124
	Subtotal, Task 3	28	80	140	248
4.0	**Prepare Case Studies**				
4.1	Prepare draft case studies	36	360	200	596
4.2	Prepare final case studies	27	72	72	171
	Subtotal, Task 4	63	432	272	767
5.0	**Prepare Analysis Report**				
5.1	Prepare draft analysis report	40	200	100	340
5.2	Prepare final analysis report	16	60	40	116
5.3	Convene oral briefing on analysis findings	8	40	24	72
	Subtotal, Task 5	64	300	164	528
	TOTAL, All Tasks	**217**	**1004**	**704**	**1925**

Appendix A
Literature Review Report

Humanitas, Inc.
management + technology consulting

National Heart, Lung, and Blood Institute
Global Health Initiative Evaluation Feasibility Study
Contract Number: GS00F0024M
Order Number: HHSN26820100062U

REVISED LITERATURE REVIEW REPORT
Deliverable 3

Submitted by: Humanitas, Inc.

November 16, 2012

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LITERATURE REVIEW REPORT

This document is *Deliverable 3, Revised Literature Review Report*, for the NHLBI Global Health Initiative Centers of Excellence (GHI COE) Evaluation Feasibility Study. It summarizes the methods, results, and implications of literature review conducted in early October 2012.

1. Purpose

The purpose of the literature review was to gather, read, and assess the potential usefulness of published information to inform subsequent study activities. Literature review focused on these four topics:

- Performance metrics used to report outcomes of similar international global health research programs for research, training, capacity building, and sustainability
- Potential new performance metrics for similar programs, based on factors that experts have identified as relevant to success in generating desired outcomes
- Possible methods for conducting an outcome evaluation of the Centers of Excellence Program
- Other global health research programs that could be used as comparison groups for the Centers of Excellence Program

2. Methods

This literature review was conducted from October 10-17, 2012 and revised from November 9-16, 2012 in response to comments provided by the COR. Consistent with the approach described in the approved Literature Review Plan (Milestone B), we searched the peer-reviewed and gray literature for pertinent publications, documented identified citations, abstracted relevant data elements, and report our findings herein.

Literature review included four key steps:

- **Experiment with search terms to identify the keyword combinations that yield pertinent literature for review**. We found that the generic nature of many of the keywords associated with this project (e.g., research, evaluation, metrics, global) made it challenging to identify efficiently the most relevant literature. For each literature source searched, we tested several combinations of keywords and MeSH subject headings, with variations on three central concepts: evaluation (metrics, program evaluation, outcomes, etc.); biomedical research programs (research, capacity building, research training, centers of excellence, sustainability, etc.); and, global (international, collaborations, developing countries). For PubMed, key MeSH headings were "Evaluation Studies as Topic" and "Evaluation Studies."

- **Search approved databases and research resources to identify those publication citations that appeared to be relevant**. Citations for publications of potential relevance were recorded in a Microsoft Excel workbook, using the format approved in the

Literature Review Plan. With the hours available in the project for this task, we were able to complete thorough searches through PubMed, Google, Google Scholar, WorldCat, WorldWideScience, Global Health, OpenGrey, Duke University Library, and Google Blogs. (As we investigate comparable programs in greater detail during Task 4.0, we plan to augment these records with an additional search through the National Institutes of Health Library.)

- **Obtain and review** the 59 pieces of literature identified in the prior step. During our review, we focused on whether each article addressed the salient issues for this literature review (metrics already used, potential future metrics, evaluation methods, and potential comparison groups). For those 43 publications deemed to offer relevant insights, we abstracted the appropriate data elements in the approved record format. We also indexed each article by assigning key terms. These terms and the criteria we used to determine whether to assign them are shown in Table 1 below. The populated spreadsheet is provided as *Appendix A, Annotated List of Literature Reviewed*.

Table 1
Key Index Terms and Criteria for Assigning Them

Key Index Term	Criteria for Assigning Index Term
Metric in use – research Metric in use – training Metric in use – capacity building Metric in use - sustainability	Discusses metrics already used to evaluate programs with similar attributes, by topic of interest
Potential metrics	Discusses or suggests potential new metrics
Methods	Discusses or suggests methods or considerations for a program or outcome evaluation of a similar program
Comparison	Discusses program(s) with comparable features for consideration as potential comparisons, in whole or in part
Process	Discussion or suggestion of considerations regarding process evaluations of similar programs

- **Analyze the abstracted data and report results.** This document follows the approved literature review report outline for reporting about the literature review.

3. Findings

This section presents findings from the literature review.

Overall, review of this literature suggests that there is limited experience in evaluating collaborative global health research and training programs. Although a considerable amount of money is directed to global health issues, evaluation activities receive low levels of funding. As a result, there is limited definitive evidence of outcomes or impact from these expenditures for global health in the developing world. This gap was noted in an unsigned editorial in the Lancet (Anonymous, 2010) that called for making evaluation the top priority in global health.

Evaluation matters. Evaluation is science. And evaluation costs money. It's time that the global health community embraced rather than evaded this message.

Performance Metrics Used. Twelve publications described the actual use of metrics to measure some elements of global health research and training program performance (Aarons, 2008; Banzi, 2011; Bates, 2011 (Indicators); Bates, 2011 (Assessing); Kellerman, 2012; Lal, 2003; Makinson, 2004; Matee, 2009; Mayhew, 2008; Minja, 2011; Tugwell, 2006; Zuckerman, 2006). Naturally, metrics varied, depending upon the evaluation design and project being studied. Typical quantitative metrics were number of staff trained (by degree or other training), number of peer-reviewed publications, number of first authored papers by southern partner, etc. Typical qualitative metrics included student/trainee satisfaction, and reported perceptions about trust and equity between research partners (individuals and/or institutions).

Authors described and grouped the metrics that now are used in various ways. Some treated research, training, or sustainability as individual elements separate from "capacity building," (e.g., Matee, 2009). Others grouped metrics now used under the umbrella term "capacity building" (e.g., Minja, 201; Mayhew, 2008).

All articles provide insight about practical issues associated with applying performance metrics to real global health research programs. Three issues are mentioned commonly as challenges to evaluation for such programs.

- The extent to which conventional (i.e., Northern) measures of biomedical research success (e.g., quantity of peer-reviewed publications, impact factors) should be top priorities in developing countries is a consideration in evaluation design (e.g., Makinson, 2004; Maselli, 2006; Tugwell, 2006; Wells, 2009; Whitworth, 2010). For example, Thornicroft (2012) describes a number of obstacles to increasing the number of peer-reviewed publications from low- and middle-income countries, including limited English language proficiency, financial barriers to publication, and the fact that journal editors may be less likely to publish such manuscripts.

- The paucity of actual results, tools, and experience with evaluation of biomedical research and training collaborations between developed and developing countries is another challenge (e.g., Banzi, 2011; Bates, 2011 (*Indicators*); Bates, 2011 (*Assessing*)). The lack of guidance and tools for such evaluations has prompted institutions and funders of projects in the developing world to turn their attention to filling this gap. As one example, KFPE (the Commission for Research Partnerships with Developing Countries), a commission of the Swiss Academy of Sciences (SCNAT) noted that little is known about the impact of research partnerships with developing countries and conducted a study on how and why to document the impact of such partnerships (Maselli, 2006).

- Lack of readily available data about metrics of interest is also a frequent obstacle to evaluation in the developing world. Chan (2010) summarizes the constraints on evaluation caused by limited data availability, quality, and use, and makes recommendations to increase data access and use. Tugwell (2006) reported that six of 12

countries studied could not provide basic information on the number of researchers and research institutions in their countries.

Potential New Metrics. Literature review identified 18 publications that discussed issues related to developing metrics for the GHI COE (see Appendix A). Although not yet vetted in an actual evaluation, many of these metrics reflect considerable expertise with research issues in the developed and developing worlds and careful thought about the desirability and construct of potential metrics for measuring outcomes.

Possible Methods for Evaluation. Literature review identified 25 publications that discussed issues that may inform development of evaluation methods for the GHI COE (see Appendix A). These publications discussed methods, or aspects of methods, that may be applicable to this project, in part or in whole, depending on program characteristics. Some publications articulate approaches to evaluation planning for programs promoting research capacity in the developing world. (Aarons, 2008; Lansang, 2004; Mahmood, 2011; Makinson, 2004; Maselli, 2006: Zuckerman, 2006). Of particular note is the Evaluation Framework used by the Fogarty International Center, which is discussed in Zuckerman, 2006. Others report findings from actual evaluations of programs that have similarities to the GHI COE but are not identical to it. For instance, we found publications that discussed evaluation issues associated with multicenter research networks that were entirely domestic (Quinlan, 2008; Trochim, 2008), global research collaboratives focused solely on infectious disease (Matee, 2009), and other multicenter global research networks that award funds to the domestic not international partner (Aarons, 2008).

Possible Comparison Groups. From the literature reviewed, we identified 11 global health research programs that may be comparable to the GHI COE. These programs are reported in *Appendix B, List of Possible Comparison Programs Identified During Literature Review*. We report the program name, program sponsor, and URL to facilitate further investigation of these programs and their characteristics.

4. Conclusions

This section describes the implications of literature review findings for the conduct of subsequent tasks in the GHI COE feasibility study.

- Current global health research and training programs may have identified performance measures and evaluation strategies that could be used by the GHI COE. Information may not be plentiful because evaluation is not always a priority for global health research and training programs.

- There is a wealth of potential performance measures and evaluation strategies that can be considered in designing an evaluation of the GHI COE. The body of knowledge identified through literature review reflects thoughtful consideration by professionals about the issues associated with evaluating research program collaborations between the developing and developed worlds. There may well be efficiencies associated with building on the frameworks and structures that have already been articulated.

- It is premature to identify specific current and potential performance measures and evaluation approaches for use in an evaluation of the GHI COE. Once we know more about the characteristics of the GHI COE programs (including program intent, size, organization, activities, funding mechanisms, and participant types), we can reference the literature to identify appropriate current and proposed measures and approaches.

- Eleven global health research programs identified in literature review are candidates for further investigation as potential comparison programs in an evaluation of the GHI COE. After the study team completes its study of the GHI COE, we will be able to determine whether and how each of the 11 programs can be used as a comparison group.

Appendix A
Annotated List of Literature Reviewed

A-1. Bibliographic Data for Literature Reviewed

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Commentary	Lutumba, P., et al. (2010)	Research capacity strengthening in the DRC	Lancet	Lutumba P, Kande V, Boelaert M, Kayembe JM, Mampunza S. Research capacity strengthening in the DRC. Lancet 2010; 375: 1080.	PMID20346811	http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2810%2960476-X/fulltext
Editorial	Anonymous, 2010.	Evaluation: the top priority for global health	Lancet	Evaluation: the top priority for global health. The Lancet - 13 February 2010 (Vol. 375, Issue 9714, Page 526) DOI: 10.1016/S0140-6736(10)60056-6		
Editorial	Drew, CH. (2012)	Measuring Partnership Activities: Partnerships in Environmental Public Health Evaluation Metrics Manual	Environ Health Perspect	Drew CH, Pettibone KG, O'Fallon LR, Collman GW: Measuring Partnership Activities: Partnerships in Environmental Public Health Evaluation Metrics Manual. Environ Health Perspect. 2012 July; 120(7): a261–a262. Published online 2012 July 2. doi: 10.1289/ehp.1205512	PMC3404686	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3404686/
Essay	Chan, M. et al. (2010)	Meeting the Demand for Results and Accountability: A Call for Action on Health Data from Eight Global Health Agencies	PLoS Med	Chan M, Kazatchkine M, Lob-Levyt J, Obaid T, Schweizer J, et al. (2010) Meeting the Demand for Results and Accountability: A Call for Action on Health Data from Eight Global Health Agencies. PLoS Med 7(1): e1000223. doi:10.1371/journal.pmed.1000223	PMC2811154	http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000223
Gray Literature	Aarons, G., et al. (2008)	Review of the International Clinical, Operational, and Health Services Research and Training Award (ICOHRTA)	Global Health Matters Newsletter	Aarons G, Fonn S, McFarland D. Review of the International Clinical, Operational, and Health Services Research and Training Award (ICOHRTA). Global Health Matters Newsletter September - October, 2008 Volume 7, Issue 5.		http://www.fic.nih.gov/about/staff/policy-planning-evaluation/documents/icohrta.pdf

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Gray Literature	Kellogg Foundation (2004)	Using logic models to bring together planning, evaluation and action: logic model development guide	W.K. Kellogg Foundation	W.K. Kellogg Foundation: Using logic models to bring together planning, evaluation and action: logic model development guide. Michigan 2004		http://www.wkkf.org/knowledge-center/resources/2006/02/WK-Kellogg-Foundation-Logic-Model-Development-Guide.aspx
Gray Literature	Lal, B., et al. (2003)	Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: A Feasibility Study	Abt Associates	Lal B, Fitzsimmons S, Carlson K, Kim L. Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: A Feasibility Study. Prepared by Abt Associates 2003.		http://www.abtassociates.com/reports/firca.pdf
Gray Literature	Makinson, C., et al. (2004)	Review of the International Training and Research Program in Population and Health (ITRPH)	Center for International Studies	Makinson C, Dym M, Harper M, Morris M. Review of the International Training and Research Program in Population and Health (ITRPH) Prepared by the Massachusetts Institute of Technology Center For International Studies, May 2004.		http://www.fic.nih.gov/about/staff/policy-planning-evaluation/documents/itrph.pdf
Gray Literature	Maselli, D., et al. (2006)	Improving Impacts of Research Partnerships	Swiss Commission for Research Partnerships with Developing Countries, KFPE	Maselli D, Lys J-A, Schmid J. 2006: Improving Impacts of Research Partnerships. Swiss Commission for Research Partnerships with Developing Countries, KFPE. GEOGRAPHICA BERNENSIA, Berne, 96 pp.		http://www.kfpe.ch/key_activities/impact_study/index.php
Gray Literature	McGann, JG. (2006).	Best practices for funding and evaluating think tanks and policy research	William and Flora Hewlett Foundation	McGann JG: Best practices for funding and evaluating think tanks and policy research. Prepared for the William and Flora Hewlett Foundation. Ambler: McGann Associates; 2006.		http://www.hewlett.org/uploads/files/BestPracticesforFundingandEvaluatingThinkTanks.pdf
Literature Type	**Author Name, Year Published**	**Article Title**	**Journal Name**	**Full Citation**	**PMID or PMCID**	**URL**

Gray Literature	Simister, N. et al. (2010)	Monitoring and Evaluating Capacity Building: Is it really that difficult?	INTRAC	Simister N, Smith, R: Praxis Paper 23: Monitoring and Evaluating Capacity Building: Is it really that difficult? International NGL Training and Research Centre (INTRAC) 2010		http://www.intrac.org/data/files/resources/677/Praxis-Paper-23-Monitoring-and-Evaluating-Capacity-Building-is-it-really-that-difficult.pdf
Gray Literature	Wixted, B., et al. (2009)	Conceptual Issues in the Evaluation of Formal	Centre for Policy Research on Science and Technology	Wixted B, Holbrook, JA: Conceptual Issues in the Evaluation of Formal Research Networks. Centre for Policy Research on Science and Technology (CPROST) Report 09-04 (2009).		http://www.sfu.ca/cprost-old/docs/wixtedholbrook08-1.pdf
Gray Literature	Zuckerman, B., et al. (2006)	Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: Phase II Outcome Evaluation	Abt Associates	Zuckerman B, Wilson A, Viola C, Lal B. Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: Phase II Outcome Evaluation. Abt Associates July 2006.		http://www.fic.nih.gov/about/staff/policy-planning-evaluation/documents/firca.pdf
Gray Literature (Institutional Paper)	Sarli, CC., et al. (2012)	The Becker Model: Indicators for Impact	Washington University	Sarli CC, Holmes KL: The Becker Model: Indicators for Impact. A Bernard Becker Medical Library Project. Washington University in St. Louis. Updated September 18, 2012.		
Peer Reviewed	Agasisti, T. et al. (2012)	Evaluating the performance of academic departments: an analysis of research-related output efficiency	Research Evaluation	Agasisti T, Catalano G, Landoni P, Verganti R: Evaluating the performance of academic departments: an analysis of research-related output efficiency. Research Evaluation 21 (2012) pp. 2–14 doi:10.1093/reseval/rvr001		http://rev.oxfordjournals.org/content/21/1/2.full

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Banzi, J., et al. (2011)	Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews	Health Res Policy Syst.	Banzi R, Moja L, Pistotti V, Facchini A, Liberati A. Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews. Health Res Policy Syst. 2011; 9: 26. Published online 2011 June 24. doi: 10.1186/1478-4505-9-26.	PMC3141787	Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews
Peer Reviewed	Bates, I., et al. (2006)	Evaluating health research capacity building: An evidence-based tool	PLOS Medicine	Bates I, Akoto AY, et al. (2006) Evaluating health research capacity building: An evidence-based tool. PLOS Medicine 3(8), 1224-1229	PMC1502158	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1502158/
Peer Reviewed	Bates, I., et al. (2011)	Indicators of sustainable capacity building for health research: analysis of four African case studies	Health Res Policy Syst.	Bates I, Taegtmeyer M, Squire SB, Ansong D, Nhlema-Simwaka B, Baba A. et al. Indicators of sustainable capacity building for health research: analysis of four African case studies. Health Res Policy Syst. 2011;9(1):14. doi: 10.1186/1478-4505-9-14.	PMC3078899	http://www.health-policy-systems.com/content/9/1/14
Peer Reviewed	Bates, I., et al. (2011)	Assessing and Strengthening African Universities' Capacity for Doctoral Programmes	PLoS Med	Bates I, Phillips R, Martin-Peprah R, et al: Assessing and Strengthening African Universities' Capacity for Doctoral Programmes. PLoS Med 2011, 8(9):e1001068, doi:10.1371/journal.pmed.1001068..	PMC3172246	http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001068
Peer Reviewed	Cooke, J. (2005)	A framework to evaluate research capacity building in health care	BMC Fam Pract.	Cooke J. A framework to evaluate research capacity building in health care. BMC Fam Pract. 2005;6:44. doi: 10.1186/1471-2296-6-44.	PMC1289281	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1289281/
Peer Reviewed	Costello, P., et al. (2000)	Moving to research partnerships in developing countries	BMJ	Costello A, Zumla A. Moving to research partnerships in developing countries. BMJ 2000; 30: 827-829.	PMC1118627	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1118627/

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Crisp, BR., et al (2000)	Four Approaches to Capacity Building in Health: Consequences for Measurement and Accountability	Health Promotion International	Crisp BR, Swerissen H, Duckett SJ: Four Approaches to Capacity Building in Health: Consequences for Measurement and Accountability. Health Promotion International, 2000, 15 (2), 99-107.		
Peer Reviewed	Glew, RH. (2008)	Promoting Collaborations Between Biomedical Scholars in the U.S. and Sub-Saharan Africa	Experimental Biology and Medicine	Glew RH: Promoting Collaborations Between Biomedical Scholars in the U.S. and Sub-Saharan Africa. Experimental Biology and Medicine, 2008, 233, 277-285.	PMID18296733	http://www.ncbi.nlm.nih.gov/pubmed/18296733
Peer Reviewed	Kagan, J., et al. (2009)	Developing a conceptual framework for an evaluation system for the NIAID HIV/AIDS clinical trials networks	Health Research Policy and Systems	Kagan JM, Kane M, Quinlan KM, Rosas S, and Trochim W. Developing a conceptual framework for an evaluation system for the NIAID HIV/AIDS clinical trials networks. Health Research Policy and Systems 2009, 7:12 doi:10.1186/1478-4505-7-12.	PMC2695433	http://www.health-policy-systems.com/content/7/1/12
Peer Reviewed	Kellerman, R., et al. (2012)	Investing in African research training institutions creates sustainable capacity for Africa: the case of the University of the Witwatersrand School of Public Health masters programme in epidemiology and biostatistics	Health Res Policy Syst.	Kellerman R, Klipstein-Grobusch K, Weiner R, Wayling S, Fonn S. Investing in African research training institutions creates sustainable capacity for Africa: the case of the University of the Witwatersrand School of Public Health masters programme in epidemiology and biostatistics. Health Res Policy Syst. 2012; 10: 11. Published online 2012 April 4. doi: 10.1186/1478-4505-10-11.	PMC3378446	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3378446/pdf/1478-4505-10-11.pdf

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Lansang, MA., et al. (2004)	Building capacity in health research in the developing world	Bull World Health Organ	Lansang MA, Rodolfo D: Building capacity in health research in the developing world. Bull World Health Organ [online] 2004, 82(10):764-770 [http://dx.doi.org/10.1590/S0042-96862004001000012], ISSN 0042-9686.	PMC2623028	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2623028/pdf/15643798.pdf
Peer Reviewed	Lazarus, J., et al. (2010)	Improving African health research capacity.	Scand J Public Health	Lazarus JV, Wallace SA, Liljestrand J. Improving African health research capacity. Scand J Public Health. 2010;38(6):670–1. doi: 10.1177/1403494810372265.	PMID20529965	http://sjp.sagepub.com/content/38/6/670.abstract
Peer Reviewed	Mahmood, S., et al. (2011)	Strategies for capacity building for health research in Bangladesh: Role of core funding and a common monitoring and evaluation framework	Health Res Policy Syst	Mahmood S, Hort K, Ahmed S, Salam M, Cravioto A: Strategies for capacity building for health research in Bangladesh: Role of core funding and a common monitoring and evaluation framework. Health Res Policy Syst. 2011 Jul 28;9:31.	PMC3169480	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3169480/
Peer Reviewed	Matee, MI., et al. (2009)	European and Developing Countries Clinical Trials Partnership (EDCTP): the path towards a true partnership	BMC Public Health	Matee MI, Manyando C, Ndumbe PM, Corrah T, Walter G Jaoko WG, et al. European and Developing Countries Clinical Trials Partnership (EDCTP): the path towards a true partnership. BMC Public Health. 2009; 9: 249. Published online 2009 July 20. doi: 10.1186/1471-2458-9-249	PMC2719636	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2559830/
Peer Reviewed	Mayhew, S., et al. (2008)	Developing health systems research capacities through north-south partnership: an evaluation of collaboration with South Africa and Thailand	Health Research Policy and Systems	Mayhew SH, Doherty J, Pitayarangsarit S. Developing health systems research capacities through north-south partnership: an evaluation of collaboration with South Africa and Thailand. Health Research Policy and Systems; 6 (8), London: BioMed Central Ltd, 2008.	PMC2559830	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2559830/pdf/1478-4505-6-8.pdf

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Mgone, C., et al. (2010)	Strengthening of the clinical research capacity for malaria: a shared responsibility	Malar J	Mgone CS. Strengthening of the clinical research capacity for malaria: a shared responsibility. Malar J. 2010; 9(Suppl 3): S5. Published online 2010 December 13. doi: 10.1186/1475-2875-9-S3-S5.	PMC3002146	Strengthening of the clinical research capacity for malaria: a shared responsibility
Peer Reviewed	Minja, H., et al. (2011)	Impact of Health Research Capacity Strengthening in Low- and Middle-Income Countries: The Case of WHO/TDR Programmes	PLoS	Minja H, Nsanzabana C, Maure C, Hoffmann A, Rumisha S, et al. (2011) Impact of Health Research Capacity Strengthening in Low- and Middle-Income Countries: The Case of WHO/TDR Programmes. PLoS Negl Trop Dis 5(10): e1351. doi:10.1371/journal.pntd.0001351	PMC3191138	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3191138/
Peer Reviewed	Moon, S. , et al. (2010)	The Global Health System: Lessons for a Stronger Institutional Framework	PLoS	Moon S, Szlezák NA, Michaud CM, Jamison DT, Keusch GT, et al. (2010) The Global Health System: Lessons for a Stronger Institutional Framework. PLoS Med 7(1): e1000193. doi:10.1371/journal.pmed.1000193	PMC2799668	http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000193
Peer Reviewed	Nchinda, T. (2003)	Research capacity development for CVD prevention: the role of partnerships	Ethn Dis.	Nchinda TC. Research capacity development for CVD prevention: the role of partnerships. Ethn Dis. 2003 Summer;13(2 Suppl 2):S40-4.	PMID13677412	http://www.ncbi.nlm.nih.gov/pubmed/13677412
Peer Reviewed	Quinlan, K., et al. (2008)	Evaluation of large Research initiatives: outcomes, challenges and methodological considerations	New Directions for Evaluation	Quinlan KM, Kane M, Trochim WM: Evaluation of large Research initiatives: outcomes, challenges and methodological considerations. New Directions for Evaluation 2008, 118:61-72		http://www.socialresearchmethods.net/research/Evaluation%20of%20Large%20Research%20Initiatives%20-%20Outcomes,%20Challenges%20and%20Methodological%20Considerations.pdf

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Thornicroft, G., et al. (2012)	Capacity Building in Global Mental Health Research	Harv Rev Psychiatry	Thornicroft G, Cooper S, Van Bortel T, Kakuma R, Lund C. Capacity Building in Global Mental Health Research. Harv Rev Psychiatry. 2012 Jan-Feb; 20(1): 13–24. Published online 2012 February 15. doi: 10.3109/10673229.2012.649117.	PMC3335140	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3335140/
Peer Reviewed	Trochim, W., et al. (2008)	The evaluation of large research initiatives: a participatory integrative mixed-methods approach	Am J Eval	Trochim WM, Markus SE, Masse LC, Moser RP, Weld PC: The evaluation of large research initiatives: a participatory integrative mixed-methods approach. Am J Eval 2008, 29(1):8-28.		http://www.socialresearchmethods.net/research/eli.pdf
Peer Reviewed	Tugwell, P., et al. (2006)	Health Research Profile to assess the capacity of low and middle income countries for equity-oriented research	BMC Public Health	Tugwell P, Sitthi-Amorn C, Hatcher-Roberts J, Neufeld V, Makara P, Munoz F, Czerny P, Robinson V, Nuyens Y, Okello D: Health Research Profile to assess the capacity of low and middle income countries for equity-oriented research. BMC Public Health. 2006 Jun 12;6:151.	PMC1539005	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1539005/
Peer Reviewed	Wells, R., et al. (2007)	Assessing outcomes of health and medical research: do we measure what counts or count what we can measure?	Aust New Zealand Health Policy	Wells R, Whitworth JA: Assessing outcomes of health and medical research: do we measure what counts or count what we can measure? Aust New Zealand Health Policy. 2007 Jun 28;4:14.	PMC1929109	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1929109/
Peer Reviewed	Whitworth, J. (2010)	Improving Implementation: Building Research Capacity in Maternal, Neonatal, and Child Health in Africa	PLoS	Whitworth J, Sewankambo NK, Snewin, VA. Improving Implementation: Building Research Capacity in Maternal, Neonatal, and Child Health in Africa. PLoS Med. 2010 July; 7(7): e1000299. Published online 2010 July 6. doi: 10.1371/journal.pmed.1000299.	PMC2897765	Improving Implementation: Building Research Capacity in Maternal, Neonatal, and Child Health in Africa

Literature Type	Author Name, Year Published	Article Title	Journal Name	Full Citation	PMID or PMCID	URL
Peer Reviewed	Whitworth, J., et al. (2008).	Strengthening capacity for health research in Africa	Lancet	James AG, Whitworth, Kokwaro G, Kinyanjui S, Snewin VA, Tanner M, Walport M, Sewankambo N. Strengthening capacity for health research in Africa. Lancet. 2008 November 1; 372(9649): 1590–1593. doi: 10.1016/S0140-6736(08)61660-8.	PMC2607030	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2607030/
Peer Reviewed	Yukari, C., et al. (2011)	Developing independent investigators for clinical research relevant for Africa	Health Res Policy Syst.	Manabe YC, Katabira E, Brough RL, Coutinho AG, Sewankambo N, Merry C. Developing independent investigators for clinical research relevant for Africa. Health Res Policy Syst. 2011; 9: 44. Published online 2011 December 29. doi: 10.1186/1478-4505-9-44.	PMC3283488	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3283488/pdf/1478-4505-9-44.pdf
Peer Reviewed	Zumla, A., et al. (2010)	Trials and tribulations of an African-led research and capacity development programme: the case for EDCTP investments.	Trop Med Intl Health	Zumla A, Huggett J, Dheda K, Green C, Kapata N, Mwaba P. Trials and tribulations of an African-led research and capacity development programme: the case for EDCTP investments. Trop Med Intl Health 2010; 15: 489-494.	PMID20180932	http://www.ncbi.nlm.nih.gov/pubmed/20180932

A-2. Indexing and Commentary for Literature Reviewed

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Aarons, G., et al. (2008)	Review of the International Clinical, Operational, and Health Services Research and Training Award (ICOHRTA)	Comparison group Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training	Process evaluation of the first five years of the ICOHRTA program. Analyzes program implementation, identifies near-term outputs, and recommends program improvements. Includes logic model, study questions, and interview discussion guides.
Agasisti, T. et al. (2012)	Evaluating the performance of academic departments: an analysis of research-related output efficiency	Potential metrics	Describes and tests a model for describing outputs and performance of academic research departments.
Anonymous, 2010.	Evaluation: the top priority for global health	Context	Editorial advocating for evaluation to be a high priority in global health
Banzi, J., et al. (2011)	Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews	Methods Metrics in use: capacity building Metrics in use: research	Reviews approaches described in literature for assessing health research impact, categories of impact, and outcome indicators.
Bates, I., et al. (2006)	Evaluating health research capacity building: An evidence-based tool	Methods Potential metrics	Describes a tool developed to guide research capacity building efforts in Ghana. Offers possible metrics and structure for evaluation of research program design.
Bates, I., et al. (2011)	Indicators of sustainable capacity building for health research: analysis of four African case studies	Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training Metrics in use: sustainability	Describes an evaluation of four capacity-building programs in Africa. Identifies indicators of sustainability and other metrics of interest.
Bates, I., et al. (2011)	Assessing and Strengthening African Universities' Capacity for Doctoral Programmes	Methods Metrics in use: capacity building Metrics in use: research	Describes process for evaluating doctoral programs and testing of method. Offers methodological and benchmarking resources.
Chan, M. et al. (2010)	Meeting the Demand for Results and Accountability: A Call for Action on Health Data from Eight Global Health Agencies	Methods	Essay about why and how to produce accurate global health data which cites the implications of doing so for program monitoring and evaluation
Cooke, J. (2005)	A framework to evaluate research capacity building in health care	Potential metrics	Describes the need to identify ways of measuring research capacity building. Proposes a research capacity building measurement framework.

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Costello, P., et al. (2000)	Moving to research partnerships in developing countries	Potential metrics	Describes potential metrics for evaluating research collaborations with developing countries.
Crisp, BR., et al (2000)	Four Approaches to Capacity Building in Health: Consequences for Measurement and Accountability	Potential metrics	Describes various approaches to capacity building and their unique implications for program evaluation.
Drew, CH. (2012)	Measuring Partnership Activities: Partnerships in Environmental Public Health Evaluation Metrics Manual	Methods	Detailed description of how to apply evaluation techniques to partnerships
Glew, RH. (2008)	Promoting Collaborations Between Biomedical Scholars in the U.S. and Sub-Saharan Africa	Methods	Explores realities of implementing international research partnerships. Not focused on evaluation, but may offer valuable insights about developing evaluation metrics for such programs.
Kagan, J., et al. (2009)	Developing a conceptual framework for an evaluation system for the NIAID HIV/AIDS clinical trials networks	Potential metrics Methods	Describes development of a conceptual framework for evaluation of a global, clinical research program. Discusses process, metrics, and structure of program evaluation.
Kellerman, R., et al. (2012)	Investing in African research training institutions creates sustainable capacity for Africa: the case of the University of the Witwatersrand School of Public Health masters programme in epidemiology and biostatistics	Metrics in use: training	Reports results of a survey about education and career paths of 70 former graduate public health students in Africa. Offers observations about capacity building.
Kellogg Foundation (2004)	Using logic models to bring together planning, evaluation and action: logic model development guide	Methods	Reference tool re how to develop a logic model
Lal, B., et al. (2003)	Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: A Feasibility Study	Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training	Discusses possible approach to conducting a feasibility study of the 10-year FIRCA program. Suggests examining program data, designing data collection instruments, conducting a pilot test of data collection instruments and procedures to determine whether an outcome evaluation is appropriate and potentially cost-effective. Presents an Outcome Evaluation Logic Model.
Lansang, MA., et al. (2004)	Building capacity in health research in the developing world	Potential metrics	Describes approaches to building sustainable research capacity. Elements suggested may inform metric development.

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Lazarus, J., et al. (2010)	Improving African health research capacity.	Potential metrics	Describes recommendations to both donors and governments to develop research capacity in Africa.
Lutumba, P., et al. (2010)	Research capacity strengthening in the DRC	Comparison group	Commentary describing a health research program based in Zambia with global partners
Mahmood, S., et al. (2011)	Strategies for capacity building for health research in Bangladesh: Role of core funding and a common monitoring and evaluation framework	Potential metrics	Describes key issues for capacity building for health research in low and middle income countries using the example of a health research institute in Bangladesh.
Makinson, C., et al. (2004)	Review of the International Training and Research Program in Population and Health (ITRPH)	Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training	Describes and assesses achievements after 10 years of implementing the International Training and Research Program in Population and Health. Includes interviews with key program stakeholders. Evaluates the program performance in enhancing international and U.S. population research programs by training foreign nationals and conducting international collaborative studies.
Maselli, D., et al. (2006)	Improving Impacts of Research Partnerships	Methods Potential metrics	Describes findings from a study evaluating the impacts of north-south research partnerships. Study goals were to provide insights into how to achieve desired impacts and avoid impediments to doing so; stimulate discussion of impacts; and achieve better understanding of research partnership functioning. The document addresses evaluation planning. It includes case studies of seven research partnerships, including two in the health field.
Matee, MI., et al. (2009)	European and Developing Countries Clinical Trials Partnership (EDCTP): the path towards a true partnership	Comparison group Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training Metrics in use: sustainability	Describes structure, key features, and achievements of the European and Developing Countries Clinical Trials Partnership (EDCTP), a collaborative research program focused on HIV/AIDS, malaria, and TB in the sub-Saharan Africa region. Though not identical to the GHI COE, some program elements and metrics may be illustrative an informative evaluation approach.

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Mayhew, S., et al. (2008)	Developing health systems research capacities through north-south partnership: an evaluation of collaboration with South Africa and Thailand	Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training Metrics in use: sustainability	Detailed evaluation case study of a north-south health research partnership between the Health Economics and Financing Programme of the London School of Hygiene and Tropical Medicine and three partners in South Africa and Thailand.
McGann, JG. (2006).	Best practices for funding and evaluating think tanks and policy research	Potential metrics	Describes results of a study of best practices for funding and evaluating think tanks and policy research mechanisms. Notes evaluation criteria used by donors. The study presents a host of metrics for assessing institutional research and related capacity, outcomes, impact, and sustainability.
Mgone, C., et al. (2010)	Strengthening of the clinical research capacity for malaria: a shared responsibility	Potential metrics	Describes potential strategies for building research capacity in low-income countries. No discussion of metrics, per se, but discussion of elements that could inform metric development
Minja, H., et al. (2011)	Impact of Health Research Capacity Strengthening in Low- and Middle-Income Countries: The Case of WHO/TDR Programmes	Methods Metrics in use: capacity building Metrics in use: research	Reports on the impact of individual and institutional capacity strengthening programs conducted by the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) and on the factors that influenced the outcome of its Research Capacity Strengthening (RCS) activities.
Moon, S., et al. (2010)	The Global Health System: Lessons for a Stronger Institutional Framework	Considerations for process evaluation	Posits that an effective global health system must accomplish at least five core functions: (1) agenda-setting; (2) financing and resource allocation; (3) research and development; (4) implementation and delivery; and (5) monitoring, evaluation, and learning. Discusses ways to improve each of the five functional areas, focusing heavily on the World Health Organization (WHO). Describes program elements that may inform metric development or evaluation planning.

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Nchinda, T. (2003)	Research capacity development for CVD prevention: the role of partnerships	Comparison group Methods	Describes prerequisites for building successful research capacity and the process for building such capacity in the area of cardiovascular diseases. Describes challenges to achieving program success. Suggests metrics/benchmarks that indicate program success.
Quinlan, K., et al. (2008)	Evaluation of large Research initiatives: outcomes, challenges and methodological considerations	Methods	Summarizes literature and findings of four large-scale, federally- funded scientific research programs in the US and addresses three major questions on this topic: (1) What are the desired outcomes in large-scale, federally funded U.S. research initiatives?, (2) What are the major challenges in conducting these evaluations?, and (3) What methodologies are suggested by previous work? Note that the entire project is domestic; no foreign entities are involved.
Sarli, CC., et al. (2012)	The Becker Model: Indicators for Impact	Potential metrics	Presents a set of impact indicators for evaluating biomedical research
Simister, N. et al. (2010)	Monitoring and Evaluating Capacity Building: Is it really that difficult?	Methods	Discusses issues related to monitoring and evaluating NGO capacity-building initiatives.
Thornicroft, G., et al. (2012)	Capacity Building in Global Mental Health Research	Comparison groups Potential metrics	Discusses strategies for and challenges to research training and capacity building in low-resource settings. Discussion is specifically about mental health research but issues/approaches may be more broadly applicable.
Trochim, W., et al. (2008)	The evaluation of large research initiatives: a participatory integrative mixed-methods approach	Methods	Summary pilot evaluation for ELI (Evaluation of Large Initiatives) by NCI of Transdisciplinary Tobacco Use Research Centers (TTURC) initiative. Domestic only, but discusses methods used: concept mapping, logic modeling, a detailed researcher survey, content analysis and systematic peer-evaluation of progress reports, bibliometric analysis and peer evaluation of publications and citations, and financial analysis.
Tugwell, P., et al. (2006)	Health Research Profile to assess the capacity of low and middle income countries for equity-oriented research	Methods Metrics in use: capacity building Metrics in use: research	Reports on a pilot test of a framework to evaluate capacity of low- and moderate-income countries for equity-oriented research.

Author Name, Year Published	Article Title	Evaluation Topics	Comments
Wells, R., et al. (2007)	Assessing outcomes of health and medical research: do we measure what counts or count what we can measure?	Methods	Makes a case for new measures of research impact, noting the limitations of the most commonly employed current measures.
Whitworth, J. (2010)	Improving Implementation: Building Research Capacity in Maternal, Neonatal, and Child Health in Africa	Comparison groups Potential metrics	Describes steps necessary to build research capacity in Africa, with a focus on improving maternal, neonatal, and child health by implementing appropriate measures. Discusses features of some health research programs underway in Africa.
Whitworth, J., et al. (2008).	Strengthening capacity for health research in Africa	Comparison groups Potential metrics	Describes requirements for health research capacity strengthening in Africa and links to programs that are addressing this issue.
Wixted, B., et al. (2009)	Conceptual Issues in the Evaluation of Formal Research Networks	Methods Potential metrics	Discusses possible approach to evaluation of formal research networks. Includes logic model for research capacity building network.
Yukari, C., et al. (2011)	Developing independent investigators for clinical research relevant for Africa	Potential metrics	Reports results of a survey about education and career paths of 70 former graduate public health students in Africa. Offers observations about capacity building. Also discusses capacity building components and related impact measures.
Zuckerman, B., et al. (2006)	Evaluation of the Fogarty International Research Collaboration Awards (FIRCA) Program: Phase II Outcome Evaluation	Comparison group Methods Metrics in use: capacity building Metrics in use: research Metrics in use: training	Reports on a retrospective evaluation of how FIRCA influenced the career trajectories of its investigators, as well as broader influences on capacity building at the institutional and national levels. Also includes evaluation framework, program logic model and study questions.
Zumla, A., et al. (2010)	Trials and tribulations of an African-led research and capacity development programme: the case for EDCTP investments.	Comparison group Methods	Describes the establishment and accomplishments of The University of Zambia – University College London Medical School (UNZA-UCLMS) Research and Training Project, an entirely African scientist-led, south–north partnership. (See also Matee, 2009.)

Appendix B
List of Possible Comparison Programs Identified During Literature Review

ITEM	PROGRAM	PROGRAM SPONSORS	URL
1	African Health Research Forum and University Science, Humanities and Engineering Partnerships in Africa (USHEPiA)	University of Cape Town with funding from the Rockefeller Foundation, the Carnegie Corporation, the Coca Cola Foundation and the Ridgefield Foundation	http://web.uct.ac.za/misc/iapo/ushepia/bg.htm
2	Centres for Global Health Research	Wellcome Trust, UK Medical Research Council (MRC), and UK Department for International Development (DID)	http://www.wellcome.ac.uk/Funding/Biomedical-science/Funding-schemes/Strategic-awards-and-initiatives/WTX059944.htm
3	Country Health Partnerships	Canadian Coalition for Global Health Research	http://www.ccghr.ca/Default.aspx?pageId=1059412
4	European and Developing Countries Clinical Trials Partnerships (EDCTP) Networks of Excellence	European Union	http://www.edctp.org/
5	European Union funded Network for the Co-ordination and Advancement of Sub-Saharan Africa-EU Science and Technology Cooperation (CAAST-Net)	European Union	http://www.caast-net.org
6	Health Research Capacity Strengthening Initiative: Kenya and Malawi	Department for International Development (UK), International Development Research Centre (Canada), and Wellcome Trust.	http://www.wellcome.ac.uk/stellent/groups/corporatesite/@sf_cross_cutting_activities/documents/web_document/wtx035037.pdf
7	Healthy Newborn Network	Bill and Melinda Gates Foundation in collaboration with global partners	http://www.healthynewbornnetwork.org
8	Neglected Tropical Diseases Fellowship Scheme	Cariplo, Gulbenkian, Merieux, Nuffield, Volkswagen (European foundations)	http://www.ntd-africa.net
9	Netherlands African Partnership for Capacity Development and Clinical Interventions against Poverty-related Diseases; Netherlands Organisation for Scientific Research	Netherlands Ministry of Foreign Affairs (DGIS), as part of the Action Programme for Sustainable Development. NACCAP is managed by the Netherlands Organisation for Scientific Research (NWO).	http://www.nwo.nl/naccap
10	Partnerships for Enhanced Engagement in Research (PEER) Program	NIH, USAID	http://sites.nationalacademies.org/pga/dsc/peer/index.htm
11	TDR (Special Programme for Research and Training in Tropical Diseases). Initiative to Strengthen Health Research Capacity in Africa	UNICEF, UNDP, WHO, World Bank	http://apps.who.int/tdr/svc/grants/calls/ishreca

Appendix B
Centers of Excellence
Key Characteristics

Characteristics	Argentina	Bangladesh	China
Funders	NHLBI	NHLBI, UHG	NHLBI, UHG
COE Name	South American Center of Excellence in Cardiovascular Health	International Centre for Diarrhoeal Disease Research	The George Institute
Institution	Institute for Clinical Effectiveness and Health Policy (IECS)	Center for Control of Chronic Diseases in Bangladesh	China International Center for Chronic Disease Prevention
Location	Buenos Aires, Argentina	Dhaka, Bangladesh	Beijing, China
Activity Sites	Bariloche, Argentina Marcos Paz, Argentina Temuco, Chile Pando, Uruguay	Dhaka, Bangladesh	Hebei Province, China Liaoning Province, China Ningxia Province, China Shaanxi Province, China Shanxi Province, China
Developed Country Partner	Tulane University School of Public Health and Tropical Medicine (SPHTM)	Johns Hopkins University, Bloomberg School of Public Health	Duke Global Health Institute
Other Partners	Universidad de La Frontera (UFRO) Universidad de la República (UdelaR)	Institute of Developmental Studies, University of Sussex, Brighton James P. Grant School of Public Health, BRAC University	Peking University Health Sciences Center China Medical University Xi'an Jiaotong University Hebei Provincial Center for Disease Control and Prevention Ningxia Medical University Changzhi Medical College The George Institute for International Health The University of Sydney The University of Queensland Imperial College
NHLBI-Funded Research Project(s)	Latin America Southern Cone: A study of cardiovascular disease and risk factors detection and follow-up	1. Health Seeking Behavior and Health Systems response: Consequence of Chronic Obstructive Pulmonary Disease (COPD)and Hypertension (HT)on Household Functioning in Bangladesh 2. Population-based study of prevalence and determinants of COPD and assessment of the rate of decline in pulmonary function in COPD cases in rural and urban settings in Bangladesh 3.Population-based study of prevalence of arterial hypertension and its risk factors, and management among the adults 20 year or older in rural and urban Bangladesh 4. Chronic diseases and poverty in Matlab, Bangladesh: Risks and trends	1. The China Rural Health Initiative, Phase 1 (Cardiovascular Risk Management) 2. The China Rural Health Initiative, Phase 2 (Salt Reduction); Simplified Cardiovascular Management (SimCard) 3. A Cluster-Randomized Trial to Evaluate the Effects of a SimCard Program in China and India

Characteristics	Guatemala	India-Bangalore	India-New Delhi
Funders	**NHLBI, UHG**	**NHLBI, UHG**	**NHLBI, UHG**
COE Name	Institute of Nutrition of Central America and Panama (INCAP)	St. John's Research Institute	Public Health Foundation of India
Institution	Comprehensive Center for the Prevention of Chronic Diseases	St. John's Research Institute	Center for cArdiometabolic Risk Reduction in South Asia (COE-CARRS)
Location	Guatemala City	Bangalore, Karnataka	New Delhi, India
Activity Sites	Southern Mexico Central America (Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica, Panama) Dominican Republic	Bangalore, India	New Delhi, India Chennai, India Karachi, PakistanIndia
Developed Country Partner	Johns Hopkins University, Bloomberg School of Public Health	Population Health Research Institute, Hamilton Health Sciences and McMaster University	Emory University
Other Partners	RAND Corporation University of Michigan, School of Public Health Harvard University, School of Public Health	Mahatma Gandhi Medical Institute of Medical Sciences Fortis Escorts Hospital and Research Institute, Jaipur Rajah Muthiah Medical College	All India Institute of Medical Science Madras Diabetes Research Foundation The Aga Khan University
NHLBI-Funded Research Project(s)	1. State-of-the-art of dietary factors associated with cardiovascular disease in Mesoamerica 2.Testing a multilevel-based intervention for the improvement of cardiovascular health in elementary school children living in poor urban areas of Guatemala (Phase 1) 3. Testing a multilevel-based intervention for the improvement of cardiovascular health in elementary school children living in poor urban areas of Guatemala (Phase 2) 4. Testing a multilevel-based intervention for the improvement of cardiovascular health in elementary school children living in poor urban areas of Guatemala (Phase 3) 5. Primary health care/community-based model for the prevention and control of cardiovascular disease in high-risk individuals living in urban areas of Costa Rica and Southern Mexico 6. Mobile Health to Prevent Progression of Pre-hypertension in Latin American Urban Settings (Phase 1) 7. Mobile Health to Prevent Progression of Pre-hypertension in Latin American Urban Settings (Phase 2)	1. PREPARE: Primary pREvention strategies at the community level to Promote treatment Adherence to pREvent cardiovascular disease 2. SPREAD: Secondary Prevention of coRonary Events After Discharge from hospital 3. INSPIRE: Indian Stroke Registry	1. CARRS Surveillance Study - Center for cArdiometabolic Risk Reduction in South Asia 2. CARRS Translation Trial

Characteristics	Kenya	Mexico	Peru
Funders	NHLBI	UHG	NHLBI
COE Name	Moi University, School of Medicine	Center for Health Promotion of Northern Mexico	Universidad Peruana Cayetano Heredia
Institution	Ampath	El Colegio de Sonora	CRONICAS Universidad Peruana Cayetano Heredia
Location	Eldoret, Kenya	Hermosillo, Sonora, Mexico	Lima, Peru
Activity Sites	Western Kenya	Northern Mexico U.S. Mexico Border	Lima, Peru Tumbes, Peru Arequipa, Peru Puno, Peru Cochabamba, Bolivia
Developed Country Partner	Duke University Medical Center	University of Arizona Mel & Enid Zuckerman College of Public Health	Johns Hopkins University, Bloomberg School of Public Health
Other Partners	Brown University Indiana University School of Medicine	Universidad de Sonora Centro de Investigación en Alimentación y Desarrollo (CIAD) Universidad Veracruzana El Colegio de la Frontera Norte E. Arizona State University	A.B. PRISMA
NHLBI-Funded Research Project(s)	1. Relationship of indoor air pollution (IAP) exposure to isolated right heart failure (IRHF) in women in Western Kenya 2. The prevalence of Markers of Atherosclerosis among Adult Patients with Congestive Heart Failure 3. A population-wide home-based study of hypertension prevalence in Western Kenya 4. Indoor Air Pollution and Its Resultant Health Effects in Kenya and Bangladesh		1. Addressing geographical variation in the progression of non-communicable diseases in Peru 2. Feasibility intervention trial of two types of improved cook stoves in three developing countries

Characteristics	South Africa	Tunisia
Funders	NHLBI, UHG	UHG
COE Name	University of Cape Town	University Hospital Farhat Hached
Institution	University of Cape Town	Department of Epidemiology, University Hospital Farhat Hached
Location	Cape Town, South Africa	Sousse, Tunisia
Activity Sites	South Africa	Tunisia Other countries in the North Africa and Eastern Mediterranean Region
Developed Country Partner	Harvard Medical School, Brigham and Women's Hospital	Department of Chronic Disease Prevention and Health Promotion, National Public Health Institute of Helsinki
Other Partners	University of Cape Town Lung Institute	Duluth Medical Research Institute, University of Minnesota Medical School
NHLBI-Funded Research Project(s)	1. Development and evaluation of tools to manage chronic non-communicable diseases 2. An Evaluation of Community Health Workers in Screening for CVD in the Community in four NHLBI/United Health Centers of Excellence	

Appendix C
Cross-site Collaborative Research Partners and Projects Supported by NHLBI Supplemental Funds

Cross-site Collaborative Research Partners and Projects Supported by NHLBI Supplemental Funds

Lead COE	COE Partner(s)	Developed Country Partner(s)	Project
Argentina	Guatemala, Peru	RAND Corporation	Mobile health to prevent progression of pre-hypertension
		Tulane University School of Public Health and Tropical Medicine	Lower respiratory tract illness in children younger than five years of age and adverse pregnancy outcomes related to household indoor air pollution in Bariloche (Argentina) and Temuco (Chile)
Bangladesh	Kenya	Brown University	Indoor Air Pollution and Its Resultant Health Effects in Kenya and Bangladesh
	South Africa, Guatemala, Mexico	Harvard University Medical School / Brigham and Women's Hospital	An Evaluation of Community Health Workers in Screening for CVD in the Community in four NHLBI/United Health Centers of Excellence
		Johns Hopkins University, Bloomberg School of Public Health	Use of cookstoves, indoor air pollution, and the prevalence of respiratory morbidity and cardiovascular risk factors in three cohorts of women and children under-five years of age in rural Bangladesh
China	India - New Delhi	Duke University	Simplified Cardiovascular Management (SimCard): A Cluster-Randomized Trial to Evaluate the Effects of a SimCard Program in China and India
Guatemala	Argentina, Peru	RAND Corporation	Mobile Health to Prevent Progression of Pre-hypertension in Latin American Urban Settings
	South Africa, Bangladesh, Mexico	Harvard University Medical School / Brigham and Women's Hospital	An Evaluation of Community Health Workers in Screening for CVD in the Community in four NHLBI/United Health Centers of Excellence
India-Bangalore	No supplemental funding	No supplemental funding	No supplemental funding
India-New Delhi	China	Duke University	Simplified Cardiovascular Management (SimCard): A Cluster-Randomized Trial to Evaluate the Effects of a SimCard Program in China and India
Kenya	Bangladesh	Brown University	Indoor Air Pollution and Its Resultant Health Effects in Kenya and Bangladesh
	Peru	Johns Hopkins University, Brown University	Feasibility Intervention Trial of Two Types of Improved Cookstoves in Three Developing Countries
		Duke University Medical Center	The Impact of Clean Cookstoves on Acute Lower Respiratory Tract Infection in Children Under 5 Years in Kenya
Mexico	South Africa, Bangladesh, Guatemala	Harvard University Medical School / Brigham and Women's Hospital	An Evaluation of Community Health Workers in Screening for CVD in the Community in four NHLBI/United Health Centers of Excellence
Peru	Guatemala, Argentina	RAND Corporation	Mobile Health to Prevent Progression of Pre-hypertension in Latin American Urban Settings
	Kenya		Feasibility intervention trial of two types of improved cook stoves in three developing countries
		Johns Hopkins University, Bloomberg School of Public Health	Lung Ultrasound as a Point-of-Care Diagnostic Approach For Pneumonia Outcomes in Improved Cookstove Intervention Trials
South Africa	Bangladesh, Guatemala, Mexico	Harvard University Medical School / Brigham and Women's Hospital	An Evaluation of Community Health Workers in Screening for CVD in the Community in four NHLBI/United Health Centers of Excellence
Tunisia	No supplemental funding	No supplemental funding	No supplemental funding

Appendix D
Evaluation Framework

Evaluation Framework for Global Health Initiative Centers of Excellence Program

STANDARDS	INDICES	MEASURES
1.A. Nearly all trainees in the GHI Centers of Excellence training programs successfully complete their planned training.	1.A.1 95% of trainees in the GHI Centers of Excellence training programs successfully complete their planned training.	1.A. # and % of trainees in the GHI Centers of Excellence training programs who successfully complete their planned training during the award period, overall and by Center of Excellence, by characteristics of interest.
	1.A.2. 95% of trainees in the GHI Centers of Excellence training programs earn degrees or other credentials in the field, during the award period.	1.A.2.1 # and % of trainees in the GHI Centers of Excellence training programs who earn degrees in the field, by degree type, overall and by Center of Excellence, during the award period.
		1.A.2.2. # and % of trainees in the GHI Centers of Excellence training programs who earn certifications, licenses, or other credentials in the field of CVPD research, by credential type, overall and by Center of Excellence, during the award period.
1.B. Nearly all trainees of the GHI Centers of Excellence training programs embark on careers in CVPD research after completing the planned training.	1.B. 95% or more of trainees from GHI Centers of Excellence training programs pursue additional degrees or research training, earn career development funding, or accept a professional position in the CVPD research field within one year of the last day of the award period.	1.B. # and % of former trainees of the GHI Centers of Excellence training programs who pursue additional degrees or research training, earn career development funding, or accept a professional position in the CVPD research field within one year of the last day of the award period.
1.C. Most graduates of the GHI Centers of Excellence training programs are still pursuing careers in CVPD research five years after the end of the award period.	1.C. 75% or more of graduates of the GHI Centers of Excellence training programs hold a professional position featuring CVPD research five years after the end of the award period.	1.C. # and % of graduates of the GHI Centers of Excellence training programs who hold a professional position featuring CVPD research five years after the end of the award period.
1.D. Most graduates of the GHI Centers of Excellence training programs pursue their research careers in a developing country after completing their training.	1.D. 75% or more of graduates of the GHI Centers of Excellence training programs pursue their research careers in a developing country after completing their training.	1.D. # and % of graduates of the GHI Centers of Excellence training programs who: -- pursue research careers in developing countries after completing their training, measured one year and ten years after the end of the award period; -- pursue research careers in developed countries after completing their training, measured one year and ten years after the end of the award period; or, -- receive research training in a developed country during or after Centers of Excellence training and who return to developing countries, within one year and ten years after the end of the award period.

STANDARDS	INDICES	MEASURES
1.E. All postdoctoral trainees in the GHI Centers of Excellence training programs demonstrate academic research skills during the award period by: -- authoring or coauthoring a peer-reviewed article in the field that is accepted or published; -- making at least one peer-reviewed presentation at a national scientific meeting in the field; -- submitting application for or earning funding for a new research project in the field; or, -- demonstrating other types of scientific achievements.	1.E. 100% of postdoctoral trainees in the GHI Centers of Excellence training programs: -- author or coauthor a peer-reviewed article in the field that is accepted or published; or -- make at least one peer-reviewed presentation at a regional, national, or international scientific meeting in the field; -- submit an application for or earn funding for a new research project in the field; or, -- demonstrating other types of scientific achievements.	1.E.1. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who author or coauthor a peer-reviewed article in the field that is accepted or published during the award period, by trainee type, by Center of Excellence and overall.
		1.E.2. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who make at least one peer-reviewed presentation at a regional, national, or international scientific meeting in the field during the award period, by trainee type, by Center of Excellence and overall.
		1.E.3. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who submit an application or earn funding for at least one research project in the field; in the field during the award period, by trainee type, by Center of Excellence and overall.
		1.E.4. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs with other types of notable scientific achievements (e.g., patents, software) in the CVPD field during the award period, by trainee type, by Center of Excellence and overall.
1.F. All GHI Centers of Excellence identify lessons learned about how to train specified quantity and types of LMIC researchers capable of independent research in chronic, noncommunicable CVPD during the award period.	1.F. All GHI Centers of Excellence describe all expected and unexpected CVPD research training outcomes.	1.F. Nature and extent of unexpected research training outcomes experienced by trainees in the GHI Centers of Excellence training programs.

STANDARDS	INDICES	MEASURES
2.A. All GHI Centers of Excellence demonstrate compliance with NIH research policies during the award period.	2.A. 100% of GHI Centers of Excellence develop and implement research polices and practices specified by their contracts with NIH during the award period.	2.A. # and % of GHI Centers of Excellence that successfully implement each research policy and practice as specified by their contracts with NIH during the award period.
2.B. All GHI Centers of Excellence grantee institutions have adequate research faculty and research support staff to conduct research to NIH standards.	2.B. 75% or more of GHI Centers of Excellence grantee institutions have adequate research faculty and research support staff to conduct research to NIH standards.	2.B Number of research faculty and research support staff allocated to COE CVPD research, by Center of Excellence and overall, during the award period.
2.C. Nearly all GHI Centers of Excellence obtain IRB approval for additional research projects within the award period.	2.C. 95% of GHI Centers of Excellence obtain IRB approval for additional research projects (in addition to Centers of Excellence funds) within the award period.	2.C. # and % of GHI Centers of Excellence that obtain IRB approval for additional research projects (in addition to Centers of Excellence funds), by subject area and type of research, within the award period.
2.D. Nearly all GHI Centers of Excellence secure funding for additional research projects (in addition to Centers of Excellence funds) within the award period.	2.D. 95% of GHI Centers of Excellence secure funding for additional research projects (in addition to Centers of Excellence funds) within the award period.	2.D. # and % of GHI Centers of Excellence that secured additional research funding (in addition to Centers of Excellence funds), by subject area and type of research, within the award period.
2.E. All GHI Centers of Excellence demonstrate the ability to recruit and retain nearly all trainees within the award period.	2.E.1 Each GHI Center of Excellence successfully recruits candidates for 90% or more of available trainee slots within the award period.	2.E.1. # and % of GHI Centers of Excellence that fill 90% or more of trainee slots, during the award period.
	2.E.2. Each GHI Center of Excellence successfully retains 90% or more of trainees through the end of their planned training within the award period.	2.E.2. # and % of trainees who entered training, completed training, and left the program within the award period, by trainee type, Centers of Excellence, and overall.
2.F. All GHI Centers of Excellence provide a state-of-the-art curriculum appropriate for research training in the field of CVPD within the award period.	2.F. 100% of GHI Centers of Excellence provide a state-of-the-art curriculum appropriate for research training in the field of CVPD within the award period.	2.F. Nature of CVPD research training curricula provided by GHI Centers of Excellence, within the award period.
2.G. All GHI Centers of Excellence that include a mentoring component provide substantive mentoring to research trainees within the award period.	2.G. 100% of GHI Centers of Excellence that include a mentoring component provide substantive mentoring to research trainees within the award period.	2.G. % of COE faculty members for whom programs report one of the following during the award period: At least one joint publication by faculty member and trainee; Narrative description of trainees' role in the faculty member's research is provided in annual Progress Report; or, Evidence of trainee publications resulting from faculty member's funded research, whether or not jointly authored.

STANDARDS	INDICES	MEASURES
2.H. All GHI Centers of Excellence conduct successful research collaborations in the field of CVPD within the award period.	2.H. 100% of GHI Centers of Excellence conduct successful research collaborations resulting in peer-reviewed publications in the field of CVPD within the award period.	2.H. # of Centers of Excellence demonstrating research projects and resulting publications due to research collaboration with: -- Centers of Excellence partner sites in developing country; -- other GHI Centers of Excellence; or, -- research partners outside of the Centers of Excellence network.
2.I. All GHI Centers of Excellence identify lessons learned about how to develop specified quantity and types of sustainable research and research training capacity of LMIC institutions in chronic, noncommunicable CVPD research during the award period.	2.I. All GHI Centers of Excellence describe all expected and unexpected outcomes regarding CVPD research and research training capacity during the award period.	2.I. Nature and extent of unexpected outcomes related to research capacity, research training capacity, and collaborative research, by Center of Excellence, by subject area, and other characteristics of interest.
2.J. NIH program administrators, all GHI Centers of Excellence, and the Administrative Coordinating Center identify lessons learned about how to design, administer, or manage programs to develop sustainable research and research training capacity of LMIC institutions in chronic, noncommunicable CVPD research during the award period.	2.J. NIH program administrators, all GHI Centers of Excellence, and the Administrative Coordinating Center describe all expected and unexpected outcomes regarding program design, administration, or management during the award period.	2.J. Nature and extent of unexpected outcomes associated with use of contract funding mechanism, direct funding of foreign awardees, public-private partnerships, support of research networks, supplemental awards, and other specific aspects of program design, administration, or management.

STANDARDS	INDICES	MEASURES
3.A. All GHI Centers of Excellence demonstrate contributions that increase the knowledge base in CVPD during the award period.	3.A. 100% or more of GHI Centers of Excellence demonstrate contributions to the field that increases the knowledge base in CVPD during the award period.	3.A.1 # and % of GHI Centers of Excellence with peer-reviewed publications accepted or published on CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).
		3.A.2 # of peer-reviewed publications accepted or published on Centers of Excellence CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).
		3.A.3 # and % of GHI Centers of Excellence with peer-reviewed presentations accepted or published on CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).
		3.A.4 # of peer-reviewed presentations on Centers of Excellence CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).
3.B. Most GHI Centers of Excellence demonstrate lasting contributions that increases the knowledge base in CVPD after the award period.	3.B. 75% or more of GHI Centers of Excellence demonstrate lasting contributions to the field that increases the knowledge base in CVPD after the award period.	3.B.1 # of peer-reviewed publications accepted or published on findings from GHI Centers of Excellence CVPD research within 5 years of the end of the award period, by Center of Excellence, by subject area, and author type (PI, investigator, former trainee).
		3.B.2 # of citations in peer-reviewed publications or presentations of findings from GHI Centers of Excellence CVPD research, within 5 and 10 years of the end of the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).
3.C. Most GHI Centers of Excellence impact public awareness of or health policy regarding CVPD in their countries or regions during the award period.	3.C.1. 75% or more of GHI Centers of Excellence impact public awareness of CVPD in their countries or regions during the award period.	3.C.1.1 # and % of GHI Centers of Excellence that generate media coverage of COE CVPD research in their countries or regions, during the award period.
		3.C.1.2 # and type of media coverage of COE CVPD research in their countries or regions, during the award period.
	3.C.2. 75% or more of GHI Centers of Excellence make contributions to institutional, local, national, or regional policy development to prevent or treat CVPD during the award period.	3.C.2.1. # and % of GHI Centers of Excellence make contributions to institutional, local, national, or regional policy development to prevent or treat CVPD during the award period.
		3.C.2.2. # and type of policy changes proposed, enacted, or implemented with involvement of the Centers of Excellence, during and after the award period.
3.D. All GHI Centers of Excellence identify lessons learned about how to advance specified quantity and types of information about the prevention and treatment of chronic, noncommunicable CVPD during the award period.	3.D. All GHI Centers of Excellence describe all expected and unexpected outcomes regarding the prevention and treatment of chronic, noncommunicable CVPD during the award period.	3.D. Nature and extent of unexpected outcomes related to scientific advances, and tested and new hypotheses, by Center of Excellence, by subject area, and other characteristics of interest.

Appendix E
Availability of Archival Data About Evaluation Framework Performance Measures

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
1.A. # and % of trainees in the GHI Centers of Excellence training programs who successfully complete their planned training during the award period, overall and by Center of Excellence, by characteristics of interest.	Data available for evaluation of award period outcomes	# and type of trainees, # and type of training courses, trainee characteristics	Data Collection Instruments (DCI): Training program (8), New graduate degree program (8a), Currently matriculated MS and/or PhD student (8b), Current postdoctoral research fellow (8c), Junior faculty receiving additional career establishment (8d), Trainees who received mentoring (8e), Short courses (8g), Annual / Midyear report summaries (9) Process Evaluation Table 3-15. Research training (page 3-56)
1.A.2.1 # and % of trainees in the GHI Centers of Excellence training programs who earn degrees in the field, by degree type, overall and by Center of Excellence, during the award period.	Data available for evaluation of award period outcomes	# and type of trainees, trainee characteristics	Data Collection Instruments (DCI): Training program (8), New graduate degree program (8a), Currently matriculated MS and/or PhD student (8b), Current postdoctoral research fellow (8c), Junior faculty receiving additional career establishment (8d), Annual / Midyear report summaries (9) Process Evaluation Table 3-15. Research training (page 3-56)
1.A.2.2. # and % of trainees in the GHI Centers of Excellence training programs who earn certifications, licenses, or other credentials in the field of CVPD research, by credential type, overall and by Center of Excellence, during the award period.	Data not available		
1.B. # and % of former trainees of the GHI Centers of Excellence training programs who pursue additional degrees or research training, earn career development funding, or accept a professional position in the CVPD research field within one year of the last day of the award period.	No data available re outcomes after the award period		
1.C. # and % of graduates of the GHI Centers of Excellence training programs who hold a professional position featuring CVPD research five years after the end of the award period.	No data available re outcomes after the award period		

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
1.D. # and % of graduates of the GHI Centers of Excellence training programs who: -- pursue research careers in developing countries after completing their training, measured one year and ten years after the end of the award period; -- pursue research careers in developed countries after completing their training, measured one year and ten years after the end of the award period; or, -- receive research training in a developed country during or after Centers of Excellence training and who return to developing countries, within one year and ten years after the end of the award period.	No data available re outcomes after the award period		
1.E.1. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who author or coauthor a peer-reviewed article in the field that is accepted or published during the award period, by trainee type, by Center of Excellence and overall.	Data available for evaluation of award period outcomes	# Postdoctoral trainees, # and type of trainee publications	Data Collection Instruments (DCI): Publication (5), Annual / Midyear report summaries (9) Process Evaluation Figure 3-16. Type of publications (page 3-40)
1.E.2. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who make at least one peer-reviewed presentation at a regional, national, or international scientific meeting in the field during the award period, by trainee type, by Center of Excellence and overall.	Data available for evaluation of award period outcomes	# Postdoctoral trainees, # and type of presentations	Data Collection Instruments (DCI): Presentation (4), Annual / Midyear report summaries (9) Process Evaluation 3.3.8 Dissemination—Presentations (page 3-42)
1.E.3. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs who submit an application or earn funding for at least one research project in the field; in the field during the award period, by trainee type, by Center of Excellence and overall.	Data not available		

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
1.E.4. # and % of postdoctoral trainees in the GHI Centers of Excellence training programs with other types of notable scientific achievements (e.g., patents, software) in the CVPD field during the award period, by trainee type, by Center of Excellence and overall.	Data not available		
1.F. Nature and extent of unexpected research training outcomes experienced by trainees in the GHI Centers of Excellence training programs.	Data not available		
2.A. # and % of GHI Centers of Excellence that successfully implement each research policy and practice as specified by their contracts with NIH during the award period.	All required data available	IRB approvals, Regulatory approvals	Data Collection Instruments (DCI): Research update (7) NHLBI funded research activities (9a) Process Evaluation (e.g., 3-17, 3-25)
2.B. Number of research faculty and research support staff allocated to COE CVPD research, by Center of Excellence and overall, during the award period.	All required data available	Key faculty, COE staff	Data Collection Instruments (DCI): Contact (1) Program documentation
2.C. # and % of GHI Centers of Excellence that obtain IRB approval for additional research projects (in addition to Centers of Excellence funds), by subject area and type of research, within the award period.	All required data available	# and types of research projects approved	Data Collection Instruments (DCI): Research information (6), Research Update (7), Annual / Midyear report summaries (9), NHLBI funded research activities (9a) Process Evaluation Table 3-20 (page 3-91)
2.D. # and % of GHI Centers of Excellence that secured additional research funding (in addition to Centers of Excellence funds), by subject area and type of research, within the award period.	All required data available	Additional research funding	Data Collection Instruments (DCI): Annual / Midyear report summaries (9) Process Evaluation Table 3-20 (page 3-91), Table E2. Summary of Research Studies & Challenges (page E-5), Table G3 (page G-6), Appendix I - OCE Case Studies1 (page I-1)

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
2.E.1. # and % of GHI Centers of Excellence that fill 90% or more of trainee slots, during the award period.	Data available for evaluation of award period outcomes	# of trainees, trainee characteristics	Data Collection Instruments (DCI): Training program (8), New graduate degree program (8a), Currently matriculated MS and/or PhD student (8b), Current postdoctoral research fellow (8c), Junior faculty receiving additional career establishment (8d), Trainees who received mentoring (8e), Trainees who will receive mentoring (8f), Short courses (8g), Annual / Midyear report summaries (9) Process Evaluation Table 3-15. Research training (page 3-56)
2.E.2. # and % of trainees who entered training, completed training, and left the program within the award period, by trainee type, Centers of Excellence, and overall.	Data available for evaluation of award period outcomes	# of trainees, trainee characteristics	Data Collection Instruments (DCI): Training program (8), New graduate degree program (8a), Currently matriculated MS and/or PhD student (8b), Current postdoctoral research fellow (8c), Junior faculty receiving additional career establishment (8d), Trainees who received mentoring (8e), Trainees who will receive mentoring (8f), Short courses (8g), Annual / Midyear report summaries (9) Process Evaluation Table 3-15. Research training (page 3-56)
2.F. Nature of CVPD research training curricula provided by GHI Centers of Excellence, within the award period.	Data not available		
2.G. % of COE faculty members for whom programs report one of the following during the award period: -- At least one joint publication by faculty member and trainee; -- Narrative description of trainees' role in the faculty member's research is provided in annual Progress Report; or, -- Evidence of trainee publications resulting from faculty member's funded research, whether or not jointly authored.	Data not available	# Core Faculty members	Data Collection Instruments (DCI): Publication (5), Annual / Midyear report summaries (9)

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
2.H. # of Centers of Excellence demonstrating research projects and resulting publications due to research collaboration with: -- Centers of Excellence partner sites in developing country; -- other GHI Centers of Excellence; or, -- research partners outside of the Centers of Excellence network.	Data available for evaluation of award period outcomes	# COE publications, projects	Data Collection Instruments (DCI): Publication (5), Annual / Midyear report summaries (9) Process Evaluation Figure 3-16. Type of publications (page 3-40)
2.I. Nature and extent of unexpected outcomes related to research capacity, research training capacity, and collaborative research, by Center of Excellence, by subject area, and other characteristics of interest.	Data not available		
2.J. Nature and extent of unexpected outcomes associated with use of contract funding mechanism, direct funding of foreign awardees, public-private partnerships, support of research networks, supplemental awards, and other specific aspects of program design, administration, or management.	Data not available		
3.A.1 # and % of GHI Centers of Excellence with peer-reviewed publications accepted or published on CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).	Data available for evaluation of award period outcomes	# and type of publications during award period	Data Collection Instruments (DCI): Publication (5), Annual / Midyear report summaries (9) Process Evaluation Figure 3-16. Type of publications (page 3-40), Figure 3-17, Disease topics in publications (page 3-41), Table 3-10. Disease focus in publications by COE (page 3-41)
3.A.2. # of peer-reviewed publications accepted or published on Centers of Excellence CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).	Data available for evaluation of award period outcomes	# and type of publications during the award period, by author	Data Collection Instruments (DCI): Publication (5), Annual / Midyear report summaries (9) Process Evaluation Figure 3-16. Type of publications (page 3-40), Figure 3-17, Disease topics in publications (page 3-41), Table 3-10. Disease focus in publications by COE (page 3-41)

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
3.A.3. # and % of GHI Centers of Excellence with peer-reviewed presentations accepted or published on CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).	Data available for evaluation of award period outcomes	# and type of presentations during the award period, by author and disease focus	Data Collection Instruments (DCI): Presentation (4), Annual / Midyear report summaries (9), Process Evaluation 3.3.8 Dissemination—Presentations (page 3-42), Figure 3-19. Disease focus: Presentations (page 3-43), Table 3-11. Presentation disease focus by COE (page 3-43)
3.A.4. # of peer-reviewed presentations on Centers of Excellence CVPD research during the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).	Data available for evaluation of award period outcomes	# and type of presentations during the award period, by author and disease focus	Data Collection Instruments (DCI): Presentation (4), Annual / Midyear report summaries (9) Process Evaluation 3.3.8 Dissemination—Presentations (page 3-42), Figure 3-19. Disease focus: Presentations (page 3-43), Table 3-11. Presentation disease focus by COE (page 3-43)
3.B.1. # of peer-reviewed publications accepted or published on findings from GHI Centers of Excellence CVPD research within 5 years of the end of the award period, by Center of Excellence, by subject area, and author type (PI, investigator, former trainee).	No data available re outcomes after the award period		
3.B.2. # of citations in peer-reviewed publications or presentations of findings from GHI Centers of Excellence CVPD research, within 5 and 10 years of the end of the award period, by Center of Excellence, by subject area, and author type (PI, investigator, trainee).	No data available re outcomes after the award period		
3.C.1.1. # and % of GHI Centers of Excellence that generate media coverage of COE CVPD research in their countries or regions, during the award period.	Data available for evaluation of award period outcomes	# and types of media coverage	Data Collection Instruments (DCI): Media Coverage (3)
3.C.1.2. # and type of media coverage of COE CVPD research in their countries or regions, during the award period.	Data available for evaluation of award period outcomes	# and types of media coverage	Data Collection Instruments (DCI): Media Coverage (3)

Evaluation Framework Measures	Data Availability Issues	Available Data Element(s), if any	Available Data Source(s), if any
3.C.2.1. # and % of GHI Centers of Excellence make contributions to institutional, local, national, or regional policy development to prevent or treat CVPD during the award period.	Data not available in comparable form across COEs. Anecdotal data might be available in program documentation, such as meeting notes or progress reports.		
3.C.2.2. # and type of policy or practice changes proposed, enacted, or implemented with involvement of the Centers of Excellence, during and after the award period.	Data available for evaluation of award period outcomes No data available re outcomes after the award period	# of policy changes during award period	Data Collection Instruments (DCI): Cardiovascular and pulmonary diseases (CVPD) policy changes (2), Health related policy changes (2a), Laws passed (2b), Reports released (2c), Standardized practice guideline (2d), Other policy related changes (2e)
3.D. Nature and extent of unexpected outcomes related to scientific advances, and tested and new hypotheses, by Center of Excellence, by subject area, and other characteristics of interest.	Data not available.		