Fogarty International Center

Fellows and Scholars Training Program

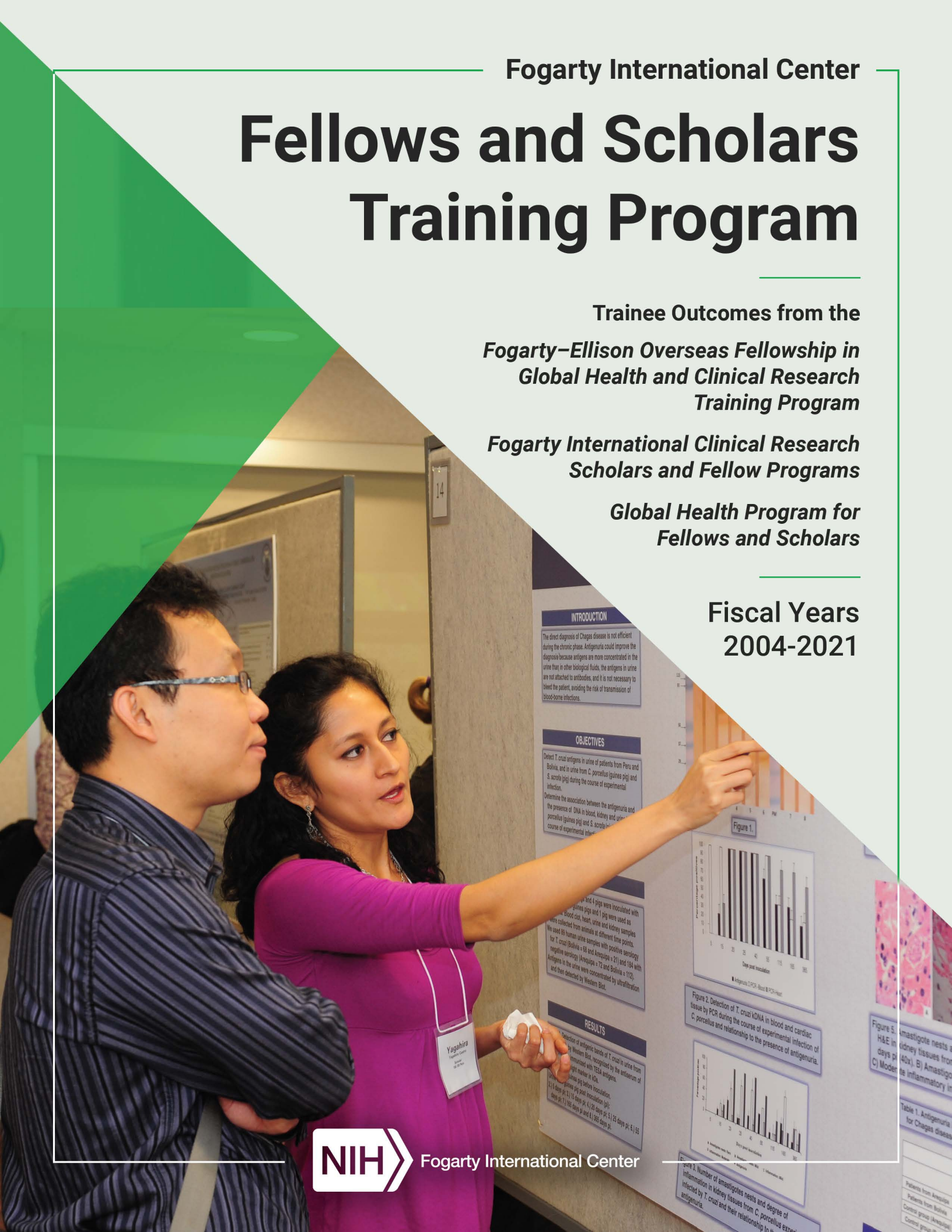
Trainee Outcomes from the

Fogarty–Ellison Overseas Fellowship in Global Health and Clinical Research Training Program

Fogarty International Clinical Research Scholars and Fellow Programs

Global Health Program for Fellows and Scholars

Fiscal Years
2004-2021



NIH Fogarty International Center

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1.0 Introduction

Cutting-edge scientific advances that improve public health are built on a foundation of multidisciplinary researchers who function across cultures and borders to solve complex health problems. Investment in the next generation of researchers is paramount. It ensures these early-stage scientists can conduct global health research, work collaboratively and equitably with peers, and develop meaningful collaborations with institutions and individuals from around the globe.

The Fogarty International Center (FIC) at the National Institutes of Health (NIH) supports year-long, mentored training at research centers in low- and middle-income countries (LMICs), enabling U.S. and LMIC trainees to understand the diverse health challenges in low-resource and international settings and to establish partnerships with local researchers to tackle complex global health issues. Through this program, FIC provides experiences that encourage young investigators to approach problems creatively and collaboratively under constraints and with opportunities that may not exist in high-income settings. These highly motivated individuals often build lasting relationships with their peers and go on to conduct research that addresses critical global health challenges.

1.1 Program Review

Ahead of the 20th anniversary of the Fellows and Scholars (F&S) Program, FIC set out to understand the long-term outcomes and impacts of the program on the careers of its trainees. Alumni were surveyed to collect both qualitative and quantitative evidence of their experience and the impact it had on their career trajectory.

This report describes the results of the review, including a survey of past trainees. The report provides a description of the methods used to collect and analyze data (Section 1); the programs' history, evolution, and portfolio of grants (Section 2); trainee results during and after the training year (Section 3); and a summary of the major findings, including recommendations for future iterations of the F&S Program (Section 4).

1.2 Methodology

The review of the F&S Program was guided by the Fogarty Framework for program assessment[1] and key elements highlighted in the program's various Notices of Funding Opportunity (NOFOs). In addition, FIC key staff were consulted to develop a plan for data collection, survey development, and/or analysis. Former grantees who have done similar trainee surveys were consulted in the question development and survey phases. All data were collected and analyzed by FIC staff in the Division of International Science Policy, Planning and Evaluation.

Primary and Secondary Data

Data on award characteristics, mechanism, funding, grantees, NOFOs, and publications were extracted from relevant NIH databases. Information about the first cycle of the program, the Fogarty–Ellison Overseas Fellowship in Global Health and Clinical Research Training Program, was obtained from

[1] Fogarty. "Fogarty Framework." https://www.fic.nih.gov/About/Staff/Policy-Planning-Evaluation/Pages/evaluation-framework.aspx. Accessed 23 Feb 2022.

internal documents as well as Fogarty publications. Available applications and progress reports were manually reviewed for supplemental information. Whenever possible, data were cross-checked across multiple sources to ascertain validity.

Survey

In an effort to provide robust qualitative evidence on the outcomes and impacts of the F&S Program, past and current trainees were surveyed. One thousand four hundred twelve trainees were initially contacted on May 17, 2022 to participate in two separate web-based surveys [available in Appendix A]. Names and emails were obtained from the FIC trainee database (CareerTrac), internal tracking spreadsheets, and/or web searches. Given the time span of the program, not all alumni were contacted; however, a good faith attempt was made to find updated email addresses (via inquiries to grantees and/or web searches) for all bounced e-mails. In the end, roughly 100 individuals were not reached. On July 18, 2022, the surveys were closed after four follow-up requests sent on June 1st, June 10th, June 24th and July 5th.

Survey 1: This anonymous survey focused on the F&S Program training experience and perceived areas of excellence and areas for improvement. A total of 717 individuals completed this survey - a response rate of 58%.

Survey 2: This survey focused on post-training accomplishments and employment. A total of 690 individuals completed this survey, a 56% response rate. This survey (see Section 3.1) was not anonymous and, therefore, the analysis was disaggregated by U.S. versus LMIC individuals as well as gender.

Bibliometric Analysis

An analysis of publications supported by the program from 2006-2021is available in Section 3.2.1. Data were obtained through the QVR Bibliography Report and analyzed by iCite. This bibliometric analysis is not comprehensive. It is not possible to ensure that the publications listed are an exhaustive list of publications related to the grants in question. Factors that impact whether a publication is reported include how grant numbers are entered by the author/journal into PubMed, if the grant is cited on the publication, or if the journal is cited in PubMed. The tree map in Figure 10 uses already determined categories in Web of Science.

2.0 Program Background and Portfolio

For almost 20 years, FIC has invested in the F&S Programs to help strengthen the global health research workforce and foster meaningful partnerships between U.S. and LMIC institutions. This program was established in 2003 with the *FIC-Ellison Overseas Fellowship in Global Health and Clinical Research Training Program*, has since evolved through multiple cycles to best achieve its intended goals, and is currently the *Launching Future Leaders in Global Health (LAUNCH) Research Training Program*.[2]

[2] NIH. "Funding Announcement for Launching Future Leaders in Global Health (LAUNCH) Research Training Program (D43 Clinical Trial Optional)" https://grants.nih.gov/grants/guide/rfa-files/rfa-tw-21-004.html Accessed 20 June 2022

2.1 Program Purpose and Objectives

Conducting research in international settings allows NIH-supported scientists to work cooperatively and equitably in creating research that will inform evidence-based practices or policies and transform the global health landscape with innovative thinking. With these concepts in mind, the F&S Program was structured with the following objectives:

1. Provide one-year, hands-on mentored research training opportunities for trainees.
2. Support diverse areas of research relevant to the health priorities of collaborating LMICs and lay a strong foundation in rigorous research design, methods, and analytic techniques.
3. Reinforce the ability of trainees to conceptualize and think through research problems with increasing independence.
4. Enhance the global health research career potential of the trainees.
5. Strengthen global health programs at U.S. academic institutions and enhance the capacity to sustain global health research at institutions in LMICs.

2.2 Program History and Structure

In 2003, Fogarty partnered with the Ellison Medical Foundation to establish the *FIC-Ellison Overseas Fellowship in Global Health and Clinical Research Training Program* (referred to as the Ellison Program). Specifically, the program provided graduate-level U.S. students in the health sciences one year of clinical research training in an LMIC while also strengthening the research capacity of the LMIC institution by supporting a matched or "twinned" LMIC trainee. Trainees were placed at LMIC research institutions that had active NIH-funded research and research training programs, with their accomplished U.S. and LMIC researchers serving as program mentors.

The recruitment, selection and matching of trainees were managed through a collaboration with the Association of American Medical Colleges (AAMC) and the Association of Schools of Public Health (ASPH). After online submission, applications were reviewed by the AAMC external review panel, followed by the Ellison Program steering committee. Selected semi-finalists were then invited to the NIH campus to present their research proposals, learn more about the global health research funded by NIH, and interview with representatives for the LMIC institutions. Final selection of the U.S. trainees depended on the rank matching of finalists and LMIC representatives and availability of funds. Once concluded, the LMIC institutions underwent their own rigorous application and selection processes to match the U.S. trainees with a host-country trainee with similar research interests. The matched LMIC trainees ranged from graduate students to post-doctoral/-professional degree holders.

Before being embedded into well-established research teams, the U.S. and matched LMIC trainees began their program year with an orientation at NIH. This event served as an opportunity to meet the new cohort of program trainees, discuss important topics in global health, and energize and inspire the trainees before they were sent off to begin their research. In its inaugural year, the notable speakers included former NIH deputy director Dr. Raynard Kington, former NIAID director Dr. Anthony Fauci, and former U.S. Surgeon General Dr. Richard Carmona. Orientation would go on to become a favored tradition within the program, occurring at the beginning of each program year.

In 2007, with the anticipated growth in size and complexity of the program, FIC changed the structure of the program to make it more centralized and awarded a grant to Vanderbilt University, in collaboration

with AAMC and ASPH on recruitment efforts. The program also expanded to include both predoctoral students (scholars) and post-doctorates (fellows). The redesigned program, renamed the *Fogarty International Clinical Research Scholars and Fellows Program* (FICRS-F), bridged the gap in Fogarty's global health research career pipeline between completion of graduate training and competitive applicants for career development and research grants. The twinning of trainees continued with LMIC trainees categorized as a scholar or fellow based on the category of their U.S. counterpart.

In 2010, FIC partnered with the U.S. Department of State's Bureau of Educational and Cultural Affairs to establish additional training opportunities for U.S. graduate students and, for a short time, post doctorates through the Fulbright-Fogarty Fellowship in Public Health. Although managed like a traditional Fulbright fellowship, the trainees are integrated into the existing F&S Program.

The substantial growth of the program over the ensuing years called for another restructuring in 2012.

In 2012, the renamed *Fogarty Global Health Program for Fellows and Scholars* supported five consortia, each consisting of four U.S. institutions plus LMIC research institution partners (hereafter referred to as Consortia I). Participating research training institutions and mentors came from the network of established research collaborations between faculty at each consortium's U.S. institutions and those in LMICs. Each consortium developed its own global health research training program and oversaw its recruitment, financial management, and program administration. With this cycle, the "twinning" of U.S. and LMIC trainees ended. Consequently, LMIC trainees were categorized according to their educational background, not pairing. Individuals pursuing or granted a terminal (non-doctoral) degree that recognizes them as a qualified professional (e.g., foreign undergraduate medical degree) were categorized as predoctoral or postdoctoral trainees, respectively, as well as those pursuing or granted a doctoral degree.

The consortia in this phase of the program were led by Vanderbilt University, University of Washington, University of North Carolina at Chapel Hill, University of California-Berkeley, and University of California-San Francisco (see Table 1 for participating institutions). In 2017, the program—renamed *Fogarty Global Health Training Program*—grew to six consortia, welcoming a newly awarded consortium led by Harvard University (hence forward referred to as Consortia II; see Table 2 for an overview of the F&S program cycles).

Table 1: U.S. Universities in Consortia I and II (2012-2021)

Global Health Equity Scholars (GHES)	
• University of California, Berkeley	• Florida International University
• Stanford University	• Yale University
GloCal Health Fellowship Program (GloCal)	
• University of California, San Francisco	• University of California, San Diego
• University of California, Los Angeles	• University of California, Davis
HBNU Fogarty Global Health Fellowship Program (HBNU)	
• Harvard University	• Northwestern University
• Boston University	• University of New Mexico
Northern Pacific Global Health Research Fellows Training Program (NPGH)	
• University of Washington	• University of Minnesota
• University of Michigan	• University of Hawaii

UJMT Fogarty Global Health Fellowship Consortium (UJMT)	
• University of North Carolina, Chapel Hill	• Tulane University
• John Hopkins University	• Morehouse School of Medicine
VECD Global Health Fellowship Consortium (VECD)	
• Vanderbilt University	• Emory University
• Cornell University	• Duke University

Table 2: Overview of the F&S Evolution by Cycle

	Ellison	FICRS	CONSORTIA I	CONSORTIA II
Active & Fiscal Years (FY)[3]	2004-2007 (FY 2004-06)	2007-2012 (FY 2007-11)	2012-2017 (FY 2012-16)	2017-2022 (FY 2017-21)
Grant Mechanism	N/A	R24	R25	D43
Administered Through	Fogarty	Vanderbilt University	Five consortia: GHES, GloCal, VECD, NPGH and UJMT	Six consortia: GHES, GloCal, VECD, NPGH, UJMT and HBNU
# of Funding ICOs	9	10	11	19
# of Trainees	185	376	427	493
# of LMICs	15	24	34	39
Noteworthy Changes		• Expanded eligibility to post-doctorates • Funded through an extramural grant	• Adopted consortium model • Ended "twinning" experience	

2.3 Portfolio of Funded Awards

2.3.1 Applications and Success Rates

Since the Ellison Program was administered internally by FIC staff, it is excluded from application and success rate data. The success rate for each cohort ranges from 20% during FICRS to 67% in Consortia II (Table 3).

Table 3: Success Rates by FOA

	Funded	Success Rate
FICRS	1	20%
Consortia I	5	56%
Consortia II	6	67%

[3] A fiscal year begins three months prior to the calendar year. It runs from October 1 to September 30 the following calendar year.

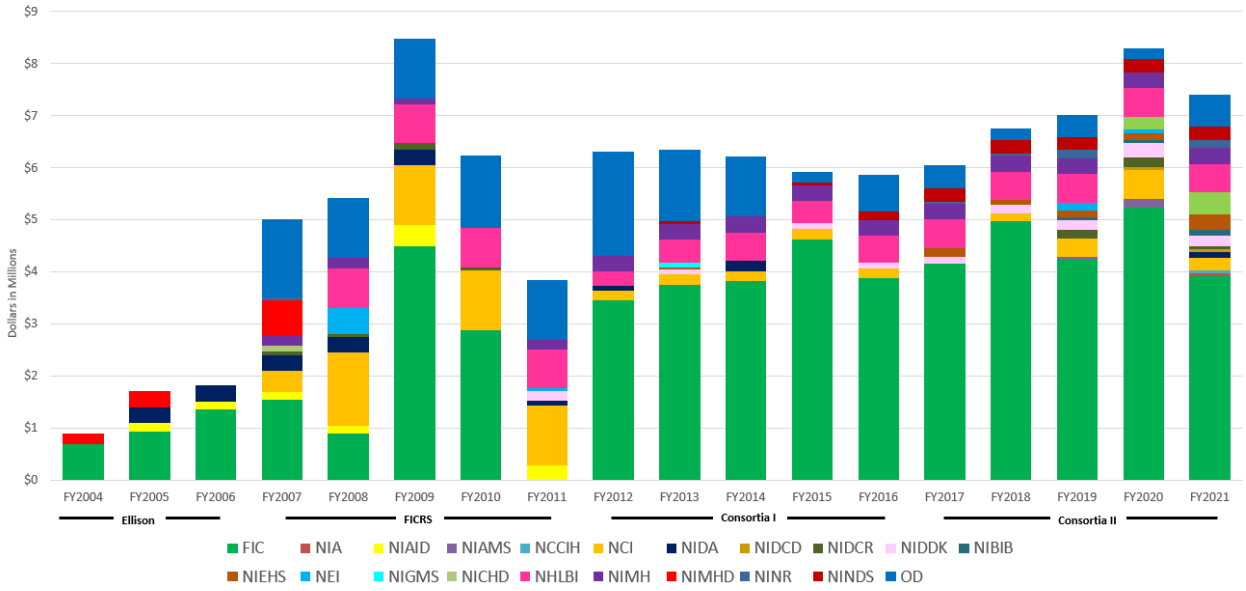
2.3.2 Funding by Program Partners

NIH ICO partners have been instrumental in the development and evolution of the F&S Programs. Early funding from NIH partners provided general support of trainees and administration of the program, as well as support for trainees whose projects aligned with the IC mission areas. As more ICOs participated in the program through ad hoc funding (funding for specific trainees, determined on an annual basis), there was a shift to supporting more scientifically diverse trainees whose research project and career interests aligned with their ICO, with FIC and OAR funding supporting the lion's share of general program administration in addition to trainees. As a result, NIH partners allowed for the participation of many more worthy trainees in the programs than could have been supported by FIC alone. The F&S programs also were beneficial to the ICOs as it allowed them to strengthen their global health presence through their support of ICO-relevant global health workforce and research.

Over the years, the F&S Programs have leveraged funding from across 24 ICOs at the NIH (Figure 1): FIC, NIA, NIAID, NIAMS, NCCIH, NCI, NIDA, NIDCD, NIDCR, NIDDK, NIBIB, NIEHS, NEI, NIGMS, NICHD, NHLBI, NIMH, NIMHD, NINR, NINDS, and various offices within the Office of the Director (OBSSR, ORWH, ORIP and OAR). From FY2004-FY2021, these partners have contributed a total of $44.7M, or 45% of the Programs' total costs.

Figure 1: Funding Sources by NIH ICO during FY2004-2021

Note: FY2009 includes ARRA funding

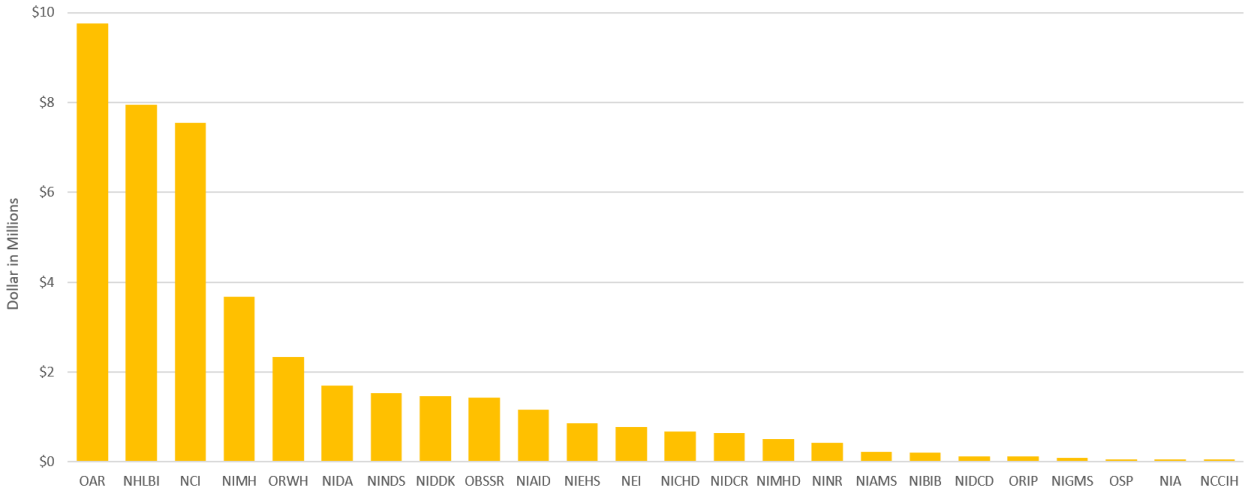


During the Ellison Program, 10 ICOs, including FIC, contributed funds. The landscape of NIH partners shifted in the FICRS-F Program. While six continued their partnership, five new ICOs provided funding, for a total of 11 ICOs. NIAID, NCI, and NIMH committed to annual funding as "committed partners" while the remaining ICOs provided "ad hoc funding." In the Consortia cycles, five ICOs committed multi-year funding for the programs (NCI, NHLBI, and NIMH in Consortium I; NHLBI, NIMH, NINDS, and ORWH in Consortium II); however, 20 ICOs provided ad hoc funding. Excluding the NIH offices, the largest funding partner is NHLBI, which contributed a total of $7.9M, followed by NCI ($7.6M), and

NIMH ($3.7M) [Figure 2]. NIMH and NCI were early partners, each participating and contributing during the Ellison Program.

As ICOs contributed funding, the scientific interests of the participating ICOs were considered in the recruitment of the trainees. For example, NHLBI provided support for trainees interested in heart, lung, and blood-related research projects in the F&S Program, just as NCI funded oncology trainees. By participating, ICOs were able to influence the types of students recruited and/or selected and the types of research investigated in the foreign institutions.

Figure 2: Total Funding by NIH ICO Partners, FY 2004-2021



2.3.4 Program Snapshot by Trainee

A total of 1477 trainees have participated in the F&S Programs. Table 4 shows the increasing number of enrolled individuals during each program cycle. The Ellison Program trained a total of 185 scholars (U.S. pre-doctoral students with their LMIC training "twins") almost evenly split between the LMIC and U.S. trainees (90 and 95, respectively). The FICRS program expanded to include 123 fellows (U.S. post-doctorates with their LMIC training twins). These FICRS trainees, again, were evenly split between the LMIC and U.S. trainees (180 and 192, respectively), which reflected the continued practice of twinning U.S. and LMIC trainees. Consortia I trained a total of 427 individuals of which most were post-doctorates (313; 73%) and from the U.S. (282; 66%). This shift continues into Consortia II with a total of 493 individuals, the largest amount in any cycle along with the largest number of consortium groups (six). Consortia II increased the enrollment of post-doctorates to 378 individuals (77%) and saw a shift back to a more even distribution of LMIC and U.S. trainees (263 and 230, respectively).

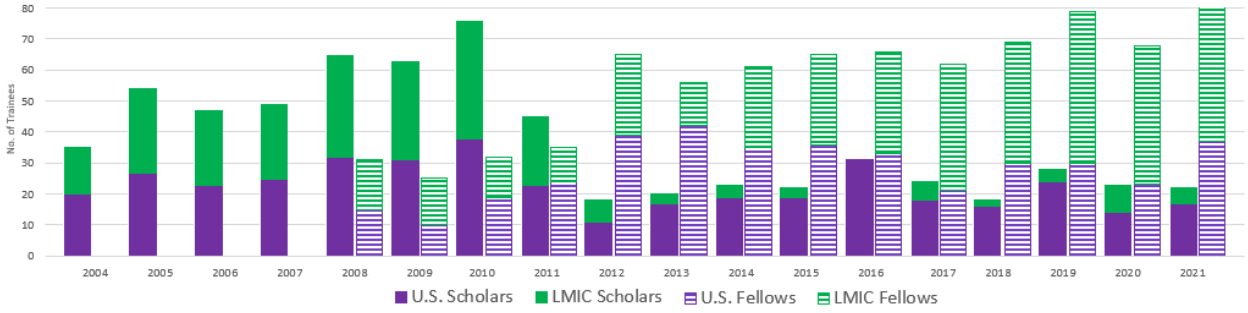
Table 4: Trainee Counts by Cohort (FY2004-FY2021)

	Ellison	FICRS	Consortia I	Consortia II
Pre-doctoral Students (Scholars)	185	249	114	115
Post- doctorates (Fellows)	N/A	123	313	378
LMIC Trainee	90	180	145	263
U.S. Trainee	95	192	282	230
Total	185	372	427	493

Trends in the type of trainees that participated in the program over the years can be seen in Figures 3 and 4. As noted previously, the early years of the F&S Programs focused primarily on U.S. pre-doctoral training with the arbitrary categorization of their matched LMIC counterpart as scholars. The transition to the consortium model in 2012 marked the end of twinning and the categorization of LMIC trainees according to their educational achievements. The shift to greater numbers of post-doctorates versus predoctoral students also resulted from a deliberate emphasis placed on post-doctoral trainees in the NOFO and reflects a preference for both U.S. and LMIC postdocs for ad hoc funding from other partners. As this is the only FIC program that provides training opportunities for U.S. students and postdocs (distinct from the career development programs), a slight emphasis on U.S. trainees using the grant base budget was considered desirable. However, ad hoc funding each year from other ICOs tended to balance these ratios.

Figure 3 also shows that during the consortium cycles of the program, the scholars (predoctoral trainees) were mostly from the U.S. (dark orange bar), whereas the fellows included a mix with the later years slightly favoring those from LMICs (light blue bar).

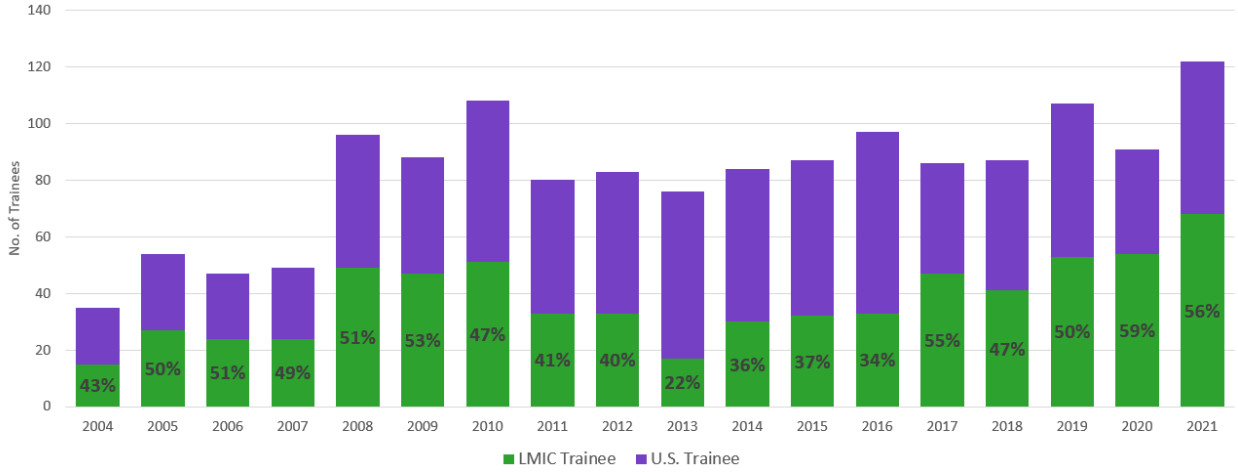
Figure 3: Type of Trainee by Fiscal Year
Note: Use of the term "scholar" for LMIC trainees during the Ellison and FICRS cycles is consistent with the label used in the program, but may not have accurately reflected the LMIC trainees' professional status.



This shift in LMIC trainees, for both pre-doctoral students and postdoctorates, is most evident in Figure 4. The total number of LMIC trainees each year is represented by the green bar along with their respective percentages. As shown, Ellison and FICRS were evenly distributed between LMIC and U.S. trainees, reflecting the "twinning" design of the program. The Consortia I cycle (FY 2012-2016) saw a decrease in LMIC participation – going as low as 22% of all trainees in 2013. This cyle of the program limited the

number of LMIC post-doctorates to 25% of total postdoctorates each year, "recognizing that additional opportunities for LMIC post-doctorates are also available through other FIC research training and research education programs at the sites."[4] During Consortia II (FY2017-2021), the distribution returned to half of all trainees being from an LMIC.

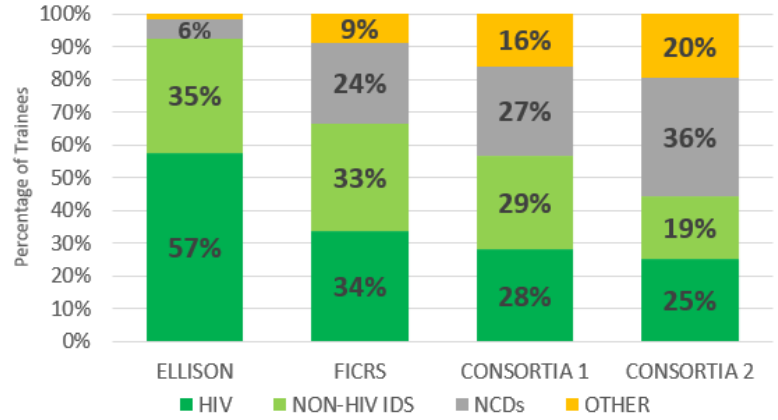
Figure 4: U.S. and LMIC Trainee Counts by Fiscal Year



In the early years of the F&S Programs, trainee projects focused mainly on the study of HIV/AIDS and other infectious diseases (Figure 5). Initially, funding for the program depended disproportionately on the availability of HIV/AIDS funds in the FIC budget (and contributions from the Office of AIDS Research), hence an emphasis on HIV/AIDS projects. As financial support increased from the growing number of NIH ICOs and Fogarty increased its non-AIDS funding, the range of research topics broadened to include areas like nephrology, heart disease, neurological disorders, mental health, and cancer, to name a few.

Figure 5: Research Area of Trainees' Projects

Note: Projects focusing on more than one category (e.g., kidney disease in people living with HIV/AIDS) are counted in both categories (e.g., NCDs and HIV). Other includes cross-cutting topics like injury/trauma, nutrition, and reproductive health.



[4] NIH. "Funding Announcement for Fogarty Global Health Training Program (D43)" https://grants.nih.gov/grants/guide/rfa-files/RFA-TW-16-002.html Accessed 14 February 2024

2.3.3 Program Snapshot by Geography

Forty-eight countries hosted at least one research project from 2004 to 2021. The number of institutions and countries expanded with each cycle (Table 5). The Ellison Program had projects in 15 countries. FICRS expanded to 24 countries. In 2012, trainees from Consortia I were scattered across 34 countries and expanded yet again to 39 countries during Consortia II. As shown in Table 4, there are a few shifts in participating countries due to shifts in economic wealth and NIH requirements. Argentina, Brazil, Chile, China and Russia were participating countries in the early years but have since had no trainees due to a shift in FIC's country eligibility.[5]

Table 5: Trainees by Countries by Cycle

Note: In 2008, three people went to both Zambia and Rwanda. In 2010, one person went to Mexico and Costa Rica. They are counted in both countries for FICRS.

	Ellison	FICRS	Consortia I	Consortia II	Totals
LATIN AMERICA & THE CARIBBEAN					
Peru	29	69	58	64	220
Brazil	15	16	18	0	49
Haiti	9	9	9	7	34
Mexico	0	1	19	6	26
Argentina	0	12	7	0	19
Guatemala	0	0	1	4	5
Suriname	0	0	0	5	5
Colombia	0	0	0	4	4
Dominican Republic	0	0	0	3	3
Honduras	0	1	2	0	3
Ecuador	0	0	0	2	2
Jamaica	0	1	1	0	2
Nicaragua	0	0	0	2	2
Bolivia	0	0	0	1	1
Chile	0	0	1	0	1
Costa Rica	0	1	0	0	1
Panama	0	0	1	0	1
AFRICA					
Kenya	10	41	49	43	143
Uganda	11	16	45	62	134
South Africa	21	25	18	38	102
Tanzania	10	18	20	34	82
Zambia	13	23	14	27	77
Malawi	0	15	25	20	60
Ghana	0	0	16	32	48
Botswana	10	10	0	10	30

[5] Fogarty. " Country Eligibility for Fogarty International Training Grants" https://www.fic.nih.gov/Grants/Pages/country-eligibility.aspx Accessed 25 August 2022.

Nigeria	0	3	1	19	23
Mali	6	8	1	3	18
Cameroon	0	0	5	9	14
Ethiopia	0	0	5	9	14
Rwanda	0	6	5	3	14
Zimbabwe	0	0	6	8	14
DRC	0	0	0	6	6
Mozambique	0	1	3	2	6
Sierra Leone	0	0	1	3	4
Liberia	0	0	1	1	2
Senegal	0	0	0	1	1
ASIA & THE PACIFIC					
India	21	29	31	34	115
China	6	40	31	0	77
Thailand	14	13	13	5	45
Bangladesh	6	16	11	5	38
Vietnam	0	2	3	4	9
Nepal	0	0	0	7	7
Malaysia	0	0	2	2	4
Samoa	0	0	0	3	3
Sri Lanka	0	0	1	1	2
EUROPE					
Ukraine	0	0	3	3	6
Russia	4	0	0	0	4
Georgia	0	0	0	1	1

3.0 Trainee-Related Results

The following section documents findings related to the trainees' experiences in the F&S Program as ascertained from two surveys administered by Fogarty (Section 1.2). Section 3.1 of this report focuses on the research training experience, particularly trainees' perspectives on program structure and mentorship. The last two sections deal with post-training accomplishments of the trainees ranging from research outputs and outcomes to current employment.

Survey 1: The first survey focused on the F&S Program training experience and perceived areas of excellence and areas for improvement. A total of 717 individuals completed this survey - a response rate of 58%. The demographics for these 717 respondents were similar to those of Survey 2. The respondents were evenly split between U.S. (359; 50%) and LMIC (358; 50%); of those reporting, 73% participated in the Consortia cycles (2012-2021) and 8% (45) from the Ellison cycle. Slightly more women responded (56%) than men (43%). Over half (59%) of responding alumni had participated in the F&S Programs as a post-doctorate.

Survey 2: A total of 786 individuals completed this survey, which focused on post-fellowship accomplishments and employment. Of those 786 individuals, 96 were currently enrolled in the F&S Program so their accomplishments are not post-fellowship and, therefore, excluded from the final tally. Therefore, the accomplishment survey had a total of 690 individuals with a 56% response rate.

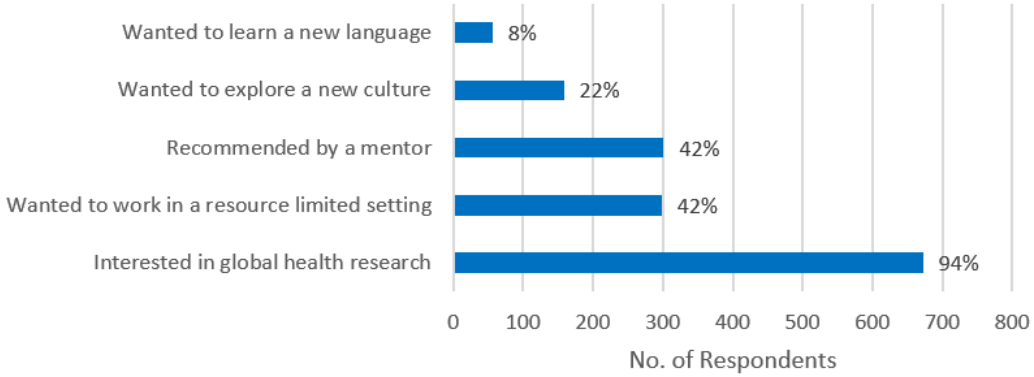
The survey respondents were evenly split between individuals from the U.S. (n=355; 51%) and LMICs (n=335; 49%). There were slightly more female respondents (n=384; 56%) than males (n=306; 44%); and there were 62% post-doctorates. Over two-thirds of all respondents were from the Consortia cycles. Only 10% of respondents (n=66) were from the Ellison Program; however, the 66 Ellison respondents represent 36% of their 185-person cycle.

3.1 Trainee Program Experience

Trainees were asked what initially drew them to apply and participate in the F&S Programs. As illustrated in Figure 6, most respondents (94%; 672) were already interested in global health research prior to engagement in the programs and felt the training program would help bolster their professional development. Forty-two percent of the respondents said they wanted to work in a low-resource setting, or a mentor recommended they apply. For those who chose "Other", the impetus to participate in the mentored research training program included:

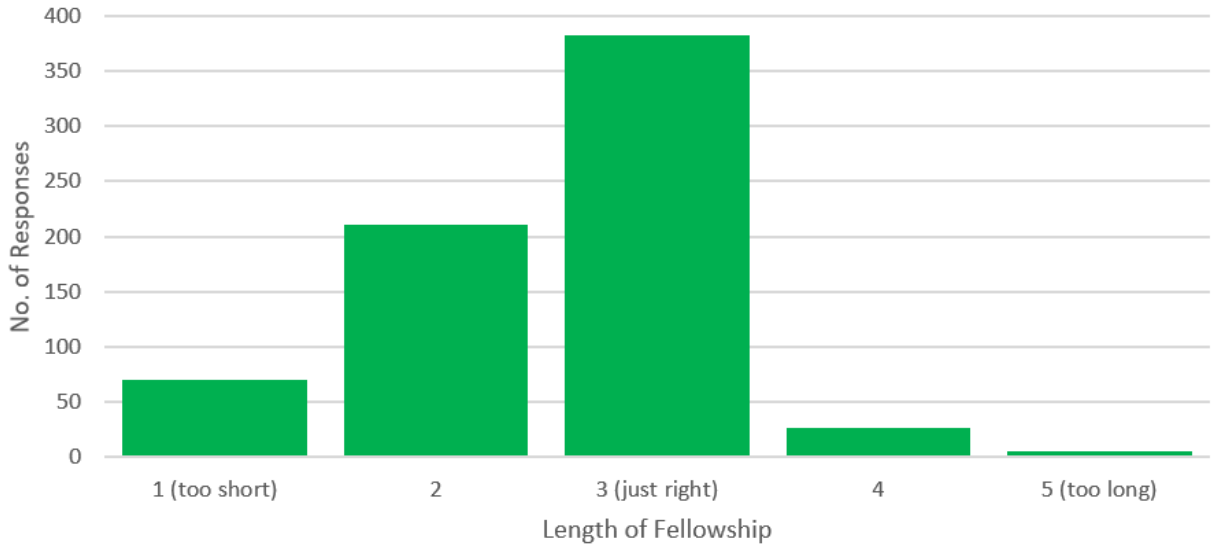
- To network with international researchers, mentors, or collaborators (2%; 14)
- To study a specific research area, population, or disease (2%; 14).
- To grow their career (3%; 19). People either wanted to launch a global health career or talked about becoming independent researchers that needed protected time.

Figure 6: Survey Responses to "Why participate in the fellowship?" (n=716)
Note: Multiple selections were allowed per respondent.



Respondents were then asked if the length of the mentored research training was sufficient in acheiving their desired outcomes/objectives. The majority of respondents (55%, 383) felt that a year was sufficient in achieving their personal goals for the program. Roughly 41%, or 281 respondents stated the length was too short (answering 1 or 2 in Figure 7) and 5% (32) said one-year was too long (answering 4 or 5 in Figure 7).

Figure 7: Survey Response to "Was the length of fellowship sufficient?"



The common arguments for it being too short of an experience included diminished overall research experience due to the COVID pandemic, time-consuming aspects of research (IRB approvals, data collection, and publishing), and the steep cultural learning curve for U.S. trainees.

When asked to reflect on the overall experience and reasons for the success or lack of success of the training, responses referred to different aspects of the program. Common themes are explained below.

Reasons for a Successful Training Year

- **Guidance from dedicated mentors**. Described in-depth in Section 3.1.3, the mentoring component of the F&S Program was identified as a major determinant of the overall success and experience of the program. Many respondents (64%; 376) noted that the single most important reason for their success was the constant communication and feedback from dedicated and encouraging mentors. Mentors helped trainees navigate a career path in global health research by providing invaluable research experience, establishing connections, and supporting personal and professional growth.
- **An international institution with a strong research environment**. Many respondents noted that training at a research institution with robust research infrastructure and resources, including longstanding collaborations and relationships in the research community and country, aided in a successful training year. For example, one respondent noted that working in a productive research environment meant access, guidance, and assistance from staff in "processing study documentation for ethics review prior to arrival in-country, help identifying research assistants to hire, and working with Human Resources to hire those staff."
- **Financial support that allowed for protected research time**. Program funding granted trainees the freedom to focus solely on research without distractions from competing financial or professional obligations. Trainees received funds for a research budget, stipend, health insurance, and/or travel.
- **Networking with peers**. The comradery of the experience was another reason for success that many respondents noted. Working with like-minded individuals helped motivate and encourage trainees in the pursuit of a global health research experience. Others enjoyed the opportunity to

interact with trainees from different parts of the world, to share experiences with other early career investigators, or to cross paths with people that they otherwise would never meet.

- **Learning opportunities throughout the mentored research training**. Respondents mentioned that many of the compulsory classes and trainings (ranging from core competency sessions to group discussions during orientation) were helpful. As one person stated, "the kick-off orientation meeting was one of the best parts of the fellowship." Another trainee mentioned his monthly sessions as enriching and helped to equip him with the basic skills to succeed in a research career. As noted by another individual, "the qualitative methods workshop I attended at the Fogarty pre-orientation was HUGE -- that remains my primary training in qualitative methods, which I have applied to several studies now and to teaching my international collaborators."
- **Exposure to a LMIC and new culture**. Especially in global health, having firsthand experience on how other researchers, organizations, patients, or health systems operate provides a context that no textbook can teach. Being in-country allowed many U.S. trainees to establish strong relationships that have gone beyond the one-year mentored research training. As one respondent stated "I would deem it a success simply because I was able to do research in an entirely different culture" or another stating that it was an "absolute joy … to live and work in an African country during my PhD studies. I loved the experience so much. It made all the difference in my success."
- **A supportive and accommodating U.S. institution/consortia.** Many of the U.S. trainees mentioned that the administrative teams managing the training programs were instrumental in the sense that they took care of the daily logistics, thereby permitting the trainee to focus on their experience at the LMIC institution. A few respondents noted that a well-established system allowed them to quickly jump into the research upon arrival. Another noted that her program was always responsive and flexible to accommodate the bureaucracy at her LMIC institution. And another stated that the administrative team allowed them "to continue working on my project (data analysis, manuscript preparation) beyond the fellowship period, and to cover costs that were not covered by the Fogarty budget."
- **Personal grit to conduct research in a low resource setting**. The commitment, persistence, drive and determination to stay focused, do hard work and persevere in adverse situations were some of the attributes that people mentioned as necessary to have a successful experience.

> "It was a very unique experience in which I felt as though I had arrived in a place where I didn't know the language, the culture, the environment, and had to make myself useful and productive, initially without any in-country guidance. I think I still made the most of it, and wouldn't trade the experience for anything, but it felt more like surviving rather than thriving initially."
>
> U.S. Predoctoral Trainee, 2008

Challenges to a Successful Training Year

- **Disruptions stemming from natural disasters.** Beyond anyone's control, the training cohorts from FY2019, 20 and 21 had to quickly adapt to the many evolving disruptions brought on by the COVID pandemic. As a result, many trainees were unable to travel or experienced delays in project or start dates. Restrictions on in-person interactions meant that working remotely reduced the ability to collaborate between trainees, staff, and mentors.
- **Competing Demands**: Many people acknowledged that protected time to conduct research was an added benefit of the mentored research training. However, there was a handful of respondents

(mostly LMIC trainees) that felt it was still challenging to continue meaningful research when there were so many clinical and administrative demands on their time. As one LMIC predoctoral trainee wrote "I was still an undergrad student and had to finish my medical degree, internship program and community service commitment that are compulsory requirements by the South African State."

- **Reimbursements**: Both U.S. and LMIC respondents acknowledged negative experiences revolving around funding and reimbursement. Many noted that delays in disbursement of funds hampered timely research management and implementation. Others mentioned that the reimbursement process was tedious with extreme lags, miscommunication, and general confusion around monetary transfers. Recommendations to help alleviate some of these financial issues can be found in Section 4.1.
- **Research Delays:** Respondents noted that their research was delayed due to issues ranging from ethical approvals (IRBs) to supply/shipping chains to protocol development. As one person noted "delayed ethical approval took a winding course that somewhat demoralized me. My mind was set on collecting data …that did not happen. Getting on other research opportunities took a slow pace as well."
- **Administrative Support**: Another challenge that many respondents faced pertained to the need for more in-country administrative support to navigate issues related to travel, housing, legal documents and visas. As one trainee shared "the fellowship program does not offer any support or guidance for obtaining the proper visa / immigration status in the project country, and fellows are effectively on their own to ensure they have the proper status to live and do research in the project country for 11+ months."

3.1.1 Twinning Experience

During the Ellison and FICRS cycles of the program, training pairs or "twins" (consisting of a U.S. and LMIC trainee matched on research interest and professional experience) were formed to enhance the research training experience. More than half (83; 62%) of respondents in the Ellison or FICRS cycles stated that the "twinning" experience was beneficial to their overall mentored research training experience. Specifically, 72% of the LMIC respondents reported having a positive experience compared to 53% of those from the U.S.

Some of the common themes that emerged for those that felt the experience was beneficial included networking, assimilating into a foreign culture, knowledge-sharing and creating lifelong friendships and collaborations. As one respondent put it, "the twin scholar played a very important role in helping me understand the local environment, to assimilate to the host country, to develop study materials and implement certain aspects of my project (the primary language in the host country was not English), and … engaged in research that I was able to help out with as well, and we were able to publish together." Another respondent noted that "having local connections right away helped a lot with working through some of the logistical issues with moving to a new country, which helped immensely with being able to get more out of the project and cultural experience."

The majority of those who didn't respond positively were either individuals who did not recall having a "twin" (n=20) or felt that their interactions were so limited that they did not benefit from it (n=16). Four individuals (3 from LMIC and 1 from U.S.) felt that the "twinning" experience was more beneficial to the

U.S. compared to the LMIC counterpart. As one noted, "the [U.S.] person was lovely, but I felt that my value in my own organization was much lower than the U.S. fellow." On the other side, a U.S. respondent noted that "unfortunately, I feel like the benefits of twinning were one-sided, and I think it would be better if the international [LMIC] scholars were paired with more experienced researchers to help them advance."

Interestingly, individuals who were both happy and unhappy with the "twinning" experiences mentioned that the research interests or professional backgrounds of the pairings were not always aligned. Responses included:

- I had a "twin" who was an [infectious disease] physician from Thailand. However, our interaction was quite limited. Our research questions were quite disparate; we were also at very different stages of our career (he had completed his ID fellowship and I was still finishing medical school).
- Twinning was beneficial for me for improving my cultural experience as we met together a handful of times, but we did not end up working together at all on any projects.
- It was great to have a partner in country. It definitely had a positive impact on my experience. However, our interests were quite different, so it didn't lead to professional productivity.
- It was not beneficial. I only saw my 'twin' twice during my entire year. He was further along in his career and was in a completely different area of research.
- [It was] beneficial. My twin and I got along well and I had a built-in friend when I arrived. We did not work on any projects directly together but we discussed our research projects and path, which was a source of support and sometimes guidance.

3.1.2 LMIC Perspective

As the F&S program evolved over the course of two decades, so did the experiences for U.S. verses LMIC trainees. U.S. participants had the opportunity to travel to a new country, experience a new culture and work in a different setting. In contrast, LMIC trainees often were already working at the LMIC institution. As a result, they were not afforded social or cultural experiences to the same extent as their U.S. counterparts.

The survey asked LMIC alumni about this discrepancy. A clear majority (86%) of respondents stated they wanted to spend more time away from their home institution; this held true for both female and male LMIC respondents. Asked where they would want to go, both male and female respondents noted they wanted to travel to the U.S. and another LMIC institution (Table 6). About 70% of respondents said they would have realistically been able to do so. However, the number differed slightly for female respondents (64% could leave their LMIC institution compared to 74% males) (Table 7).

Table 6: Alternative training sites for LMIC trainees

	Female	Male	Total
Go to both the U.S. and another LMIC site	87 (55%)	85 (46%)	172 (50%)
Go to the U.S.	46 (29%)	68 (37%)	115 (34%)
Go to another LMIC site	15 (10%)	22 (12%)	37 (11%)
None of the above	9 (6%)	9 (5%)	18 (5%)
	157	**184**	**342**

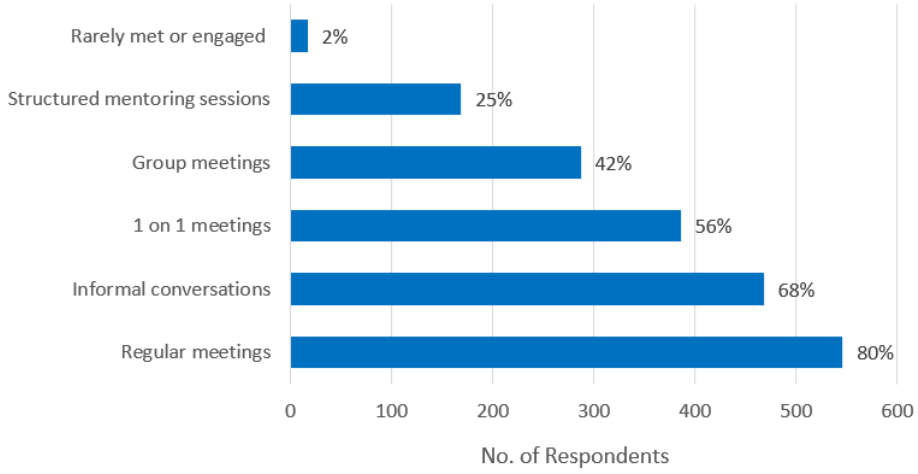
Table 7: Perceived ability to leave their LMIC institution/country for the training year

	Female	Male	Total
Yes	102 (64%)	134 (74%)	237 (70%)
No	27 (17%)	28 (15%)	55 (16%)
Unsure	30 (19%)	19 (10%)	49 (14%)
	159	**181**	**342**

3.1.3 Mentorship

Integral to the F&S Programs is mentorship. Effective mentoring builds research capacity by enhancing the training experience and promoting career development. Survey respondents were asked to specify how mentoring was conducted (Figure 8). Most respondents (80%) stated they had regular meetings with their mentor(s). The meetings were primarily informal in nature (68% of respondents), consisting of coffee chats, email exchanges, and texting (e.g., WhatsApp).

Figure 8: Mentor Model



Seventeen respondents noted minimal engagement with their mentor(s) . For some, the interactions were limited to required program reports or had to be initiated by the trainees.

Survey data show that the average time spent with LMIC versus U.S. mentors was significantly different: 92 versus 51 minutes/week, respectively. The average time (in minutes) spent with the LMIC mentor was consistent across the various demographics, although lowest for post-doctorates with an average of 82 minutes per week (Figure 9). On the other hand, the average time spent with the U.S. mentor in a week was lowest for pre-doctoral trainees at 46 minutes per week (Figure 10).

> My mentors were great. I learnt through what they shared, how they shared and even their commitment in research. [They] provided goals and timelines, assisted me to explore my potentials, [and] opened up opportunities.
>
> U.S. Predoctoral Trainee, 2008

Figure 9: Average time per week spent with LMIC mentor

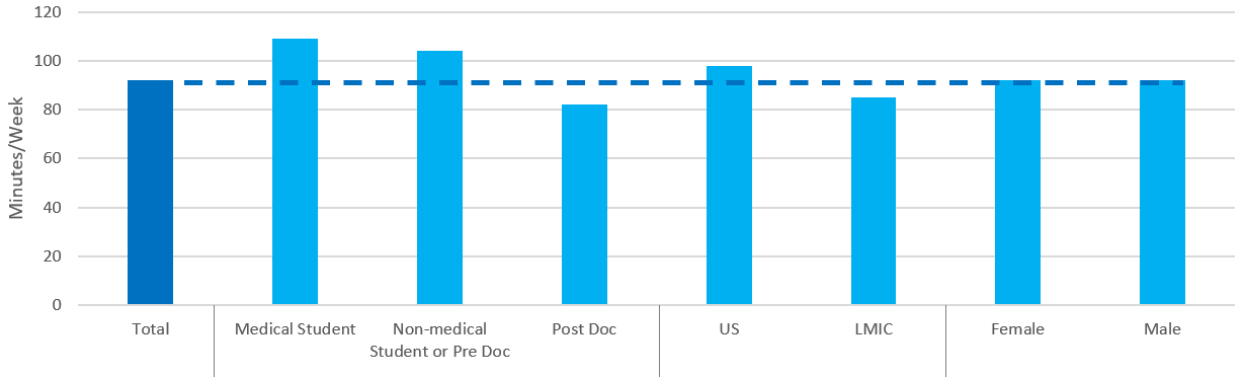
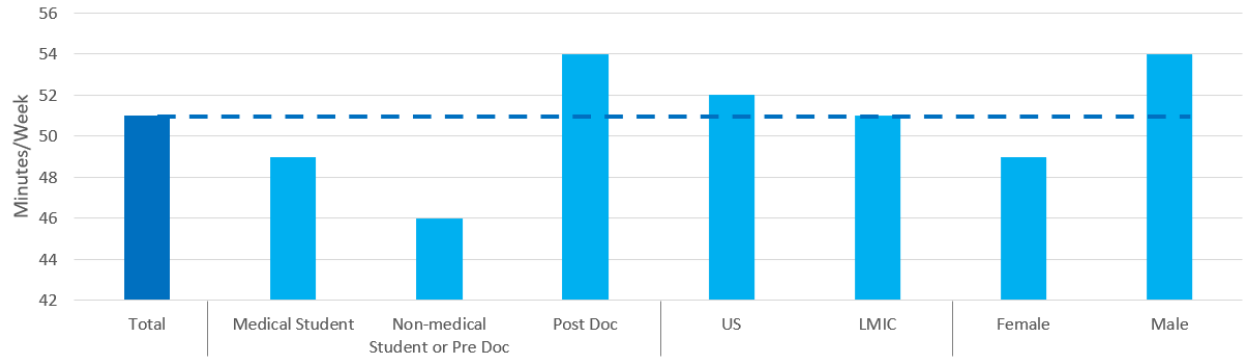


Figure 10: Average time per week spent with U.S. mentor



Lastly, alumni were asked if they felt that their mentor(s) played a significant role in their career trajectory. Mentors were instrumental for 88% of respondents across all demographics (career stage during training, gender, U.S. v. LMIC). Some examples of how mentors were vital in the careers for alum are described below.

> My mentors taught me so much about how to design high quality research studies, how to collaborate with diverse colleagues across disciplines, how to navigate complex research landscapes, research ethics in global health, and guided me on opportunities for building my methodologic and technical skills in research.
>
> U.S. Postdoctoral Trainee, 2012

- **Served as role models** on how to be more effective leaders, interact positively in work teams, and implement research. Many respondents mentioned that their mentor's expertise, knowledge, and passion for global health research were motivation to move forward professionally in the field. As one respondent succinctly put it "both [of my] mentors showed me what successful academic global health careers could look like."
- Encouraged conducting, disseminating, and securing research. Mentors helped by teaching how to **conduct sound research** whether through honing and developing critical research skills or helping to structure and manage the research. On the other end, mentees became better academic writers with some mentors reviewing **publications** for submission or helping respondents **secure research funding**.
- Helped **identify and secure post-training opportunities** outside of research. Mentors facilitated connections that helped access new opportunities and projects after the training year. Numerous

respondents mentioned that their mentors provided letters of recommendation, helped with residency applications, or secured job placements through the connections and assistance of their mentors.

- Taught **how to become a mentor** to the next generation. Interestingly, many expressed that the positive mentorship they received during their mentored research training has carried through to the present day where the trainee is now mentoring the next generation of researchers. As one person noted "I think that I learned a lot of things that have made me a better mentor, in particular, how to prevent someone from getting lost in research." Another wrote that his mentor "set the bar for my future mentorship relationships."
- **Fostered personal growth and soft skills.** While the mentors largely focused on professional development, they inevitably helped in the personal growth of their young mentees. Many respondents felt that the most helpful things the mentors did was to listen to them, help them realize their own potential and share the challenges of global health research along with the strategies to overcome them.
- Provided lifelong collaborations. Many mentors and mentees have **continued to collaborate** on projects including NIH funding or PhD dissertations. Some respondents said that they have been working with their mentors for 10 or more years. One person wrote that he has a long-term mentorship relationship that has spanned over 15 years across three countries including numerous grants together and co-mentoring of many students.

3.2 Trainee Research Outputs and Outcomes

Over the past two decades, alumni from the F&S Programs have gone on to help conduct cutting-edge research, inform policy, create new labs, develop national health guidelines, enhance health services and improve delivery practices. Survey respondents were offered opportunities to share their achievements at local, national or international levels. These accomplishments are not always directly correlated to the Fogarty training program, but it speaks to how the F&S Programs propelled and contributed to global health and global health research.

3.2.1 Publications

During their mentored research training, many of the trainees published findings from their Fogarty-funded research. A total of 2751 publications were produced under the funding of a F&S grant (Table 8). The Consortia I cohort published the most (1152), although given lag times for publishing the number of publications produced by Consortia II is likely to increase over the next few years. As such, the average publications per trainee is highest for Consortia I; on average, a Consortia I trainee published approximately 3 papers from their training year compared to a FICRS trainee who published one. This may also reflect the significant increase in postdocs for Consortium I versus FICRS.

Using the Relative Citation Ratio (RCR) as a citation-based measure of scientific influence, Consortia II had the greatest average RCR (1.7). This means that a Consortia II paper received nearly twice as many citations per year as the median NIH-funded paper in its field. RCR is calculated as the citations of a

paper, normalized to the citations received by NIH-funded publications in the same area of research and year.[6]

Table 8: Bibliometrics as of June 2022

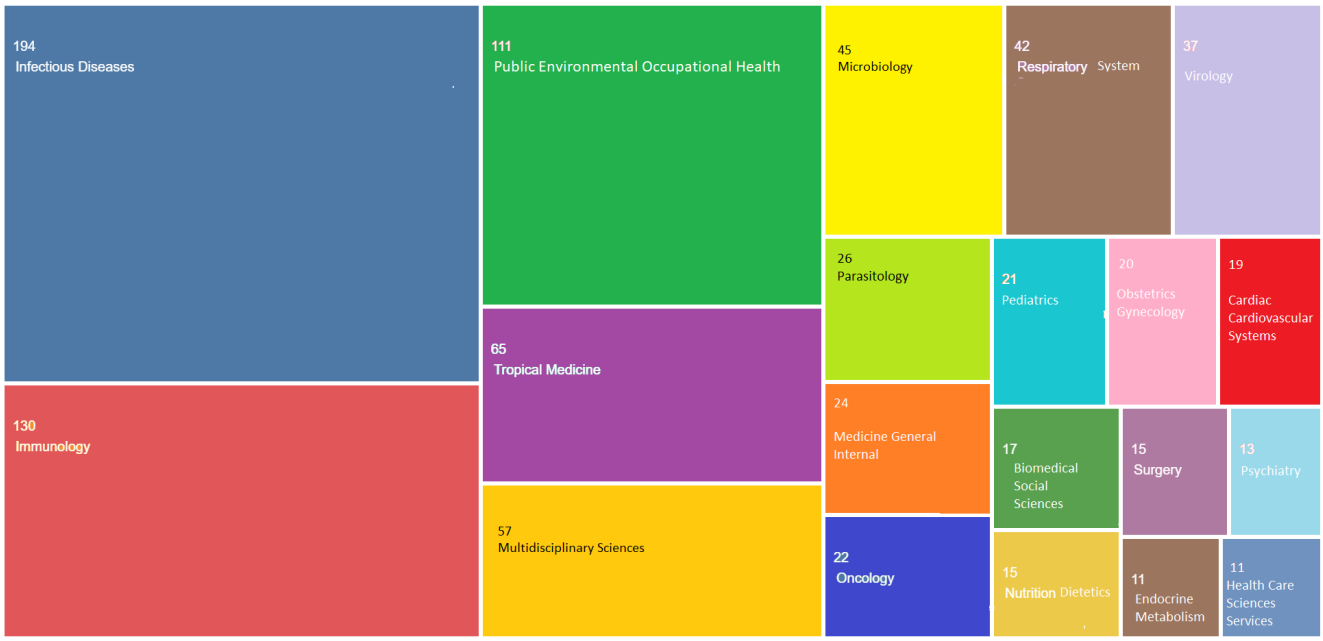
Note: Only publications linked to a grant number are displayed below. Because the Ellison Program was administered internally, there is no grant number.

	Total Pub	RCR	Citation Count	Av. Pub/Trainee
FICRS	602	1.3889	23.46	1.08
CONSORTIA I	1152	1.3814	12.55	2.70
CONSORTIA II	817	1.6972	3.56	1.66
TOTAL	2751			

Using those 2751 publications, a tree map (Figure 11) was created using the Web of Science topical areas. The larger squares indicate more publications on that topic compared to other topics for that cohort; the total number of publications in each category can be found in the upper left-hand corner of each box. The three most common topics were consistent across each cohort. They were Infectious Disease (dark blue squares); Public, Environmental, & Occupational Health (green squares); and Immunology (red squares).

Figure 11: Tree Map by Cohort

FICRS



[6] Hutchins BI, Yuan X, Anderson JM, Santangelo GM. Relative Citation Ratio (RCR): A New Metric That Uses Citation Rates to Measure Influence at the Article Level. PLoS Biol. 2016 Sep 6;14(9):e1002541. doi: 10.1371/journal.pbio.1002541. PMID: 27599104; PMCID: PMC5012559.

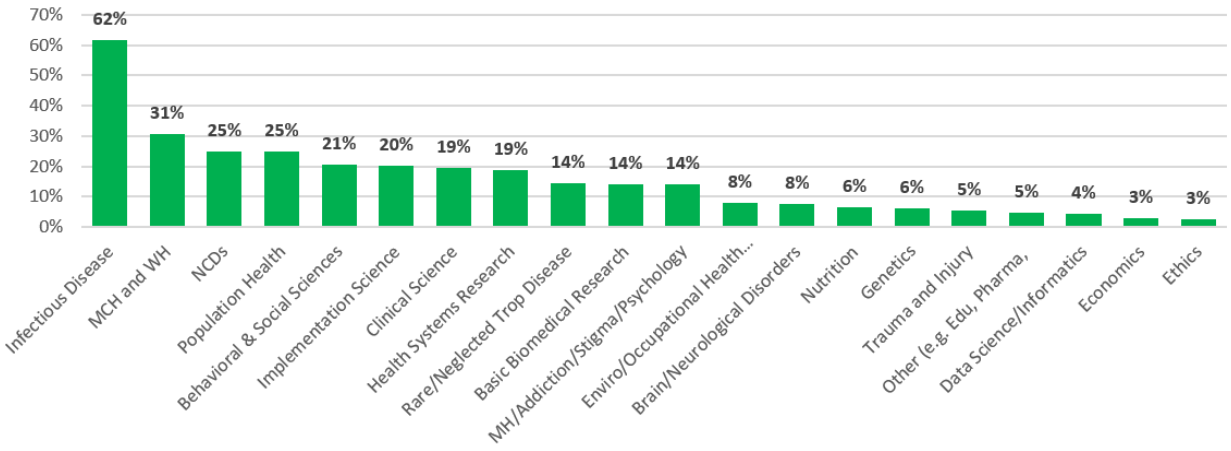
CONSORTIA I

CONSORTIA II

While publishing papers from the training year is an indication that trainees are successfully conducting research, publishing post-fellowship indicates that the alumni remained in research. A total of 605 survey respondents (90%) reported that they published after their training year ended. There was little difference when disaggregated by U.S. versus LMIC trainee (91% vs. 88%, respectively) or gender (92% of males published and 89% female).

Of those publications, 90% related to global health. Specific topics, as reported in the survey, focused on infectious diseases (62%) followed by topics related to maternal, child, and women's health topics (31%) and then Noncommunicable diseases (NCDs) and population health (both 25%; Figure 12).

Figure 12: Survey Response to Topical Areas of Post-Training Publications



3.2.2 Funding and International Research

Sixty-seven percent of responding program alumni (n=450) applied for funding after their F&S experience. This held true for both U.S. and LMIC individuals (66% v 68% respectively) and genders (69% for males and 66% for females). Of the 450 who applied and secured funding, nearly half (47%) of the funding agencies were either Fogarty or another NIH institute.

Some examples of these awards and funding activities are:

- Served as an investigator for the CDC's Clinical Immunization Safety Assessment (CISA) project, contributing to vaccine safety research and policy on a global level. (U.S. Postdoctoral Trainee, FICRS)
- Created the NIAID International Center of Excellence in Research in Cambodia in 2019. Subsequently received the 2021 NIAID Mentor of the Year award and the 2020 NIAID Merit Award (U.S. Predoctoral Trainee, FICRS)
- Developed, launched, and led a major philanthropic initiative at the Gordon and Betty Moore Foundation. The program provided over $100M in grants to minimize diagnostic errors and advance diagnostic excellence in the United States. https://www.moore.org/initiative-strategy-detail?initiativeId=diagnostic-excellence (U.S. Predoctoral Trainee, FICRS)
- Established the Human Biomonitoring Laboratory at SRIHER for the NIH funded multi-country randomized trial called Household Air Pollution Intervention Network (HAPIN) trial (LMIC Postdoctoral Trainee, Consortia I)
- Wrote and served as the PI of a successful $9.8 million grant through HRSA's Maternal Health Innovation program that has funded innovative, maternal health research in Montana to close health disparities experienced by rural and American Indian/Alaska Native individuals. The same PI was awarded a $1.5 million grant by the U.S. CDC that has created Montana's first Maternal Mortality Review Committee. (U.S. Postdoctoral Trainee, Consortia II)

- Received a Fogarty K43 Emerging Leader Award to build collaborations with researchers from the University of Utah. The alumnus is currently running a NIH R01 grant on mucosa associated T cells. (LMIC Predoctoral Trainee, FICRS)

The survey also demonstrated that the F&S Programs helped create a sustainable global network of researchers who collaborate in research and building capacity in LMICs. Both U.S. and LMIC individuals (73% both) reported in the survey that they continued to participate in international research. International research collaborations and partnerships are critical not only in generating scientific evidence but ensuring the science reaches locally relevant stakeholders that can implement new policies or health practices. Such outcomes will be discussed next.

3.2.3 Policy and Practice Outputs

This section describes examples of guidelines, policy, and health practices that have been implemented across the globe due to the research and work of F&S alumni.

Guidelines

- Led a working group for the Global Alignment of Immunization Safety Assessment in Pregnancy (GAIA) group assessment of neonatal infections. Recently, this former trainee participated in the case definition and guidelines for multisystem inflammatory syndrome in children and adults after vaccination (U.S. Postdoctoral Trainee, FICRS)
- Published treatment regimen for magnesium sulfate in pre-eclampsia (LMIC Fellow, Consortia II)
- Helped draft three institutional guidelines that are recognized as nationally approved documents for the management of Huntington's disease, myotonic dystrophy type 1 and inherited ataxias (LMIC Predoctoral Trainee, FICRS)
- Developed and authored the South African National COVID-19 guidelines for neonatal and child health care (LMIC Predoctoral Trainee, Ellison)
- Helped develop public health tools and syntheses of emerging evidence to inform the public and guide public health practice. Two examples are the Covid-19 Exposure Risk in Your County and a Guide for Daily Life Near You and Tiered Public Health and Social Measure Framework for Africa (LMIC Postdoctoral Trainee, Consortia I)
- Provided technical support for the National Tuberculosis and Leprosy Program by designing and implementing national TB and Leprosy strategic plans, funding requests, guidelines, training materials, and implementation reports (LMIC Predoctoral Trainee, FICRS)
- Developed Ghana's Childhood Cancer Strategy, as well as worked on national guidelines for the treatment of childhood cancers in Ghana (LMIC Postdoctoral Trainee, Consortia II)
- Helped write the clinical management and infection prevention and control guidelines for monkeypox while serving as the clinical management focal point for the WHO on Monkeypox (LMIC Postdoctoral Trainee, FICRS)

Health Services Practices or Policy

- Helped coordinate the QualityRights Initiative. The initiative is a web-based training on human rights and a recovery-based approach to mental health care for health professionals, persons with

mental health, caregivers, community members and key mental health stakeholders (LMIC Postdoctoral Trainee, Consortia II)

- Developed chronic pain management telehealth services for the Veterans Affair in Albuquerque and now is working in Sacramento to implement the same services (U.S. Postdoctoral Trainee, Consortia I)
- Served as an expert witness to a 2019 congressional hearing by the U.S. House Committee on Energy & Commerce, Oversight and Investigations Subcommittee on the impact of rising insulin costs. The alumna also spoke on the same topic in 2019 to NPR and published many New York Times Opinion Pages on similar topics (U.S. Postdoctoral Trainee, FICRS)
- Testified at a public hearing at FDA in May 2019 on interchangeable and biosimilar insulin products (May 2019): Portions of this presentation made it into final FDA guidance and is referenced in the Colorado Department of Law (LMIC Predoctoral Trainee, FICRS)
- Testified before the U.S. Congress twice during the COVID-19 outbreak on contact tracing and how to conduct safe elections during the pandemic (LMIC Postdoctoral Trainee, FICRS)
- Founded Accompanied Health Initiative. This initiative was aimed at advancing access to equitable healthcare for the elderly in last mile communities of Uganda (LMIC Postdoctoral Trainee, Consortia II)
- Provided research that impacted the HIV diagnostic algorithm in Zambia. The research 1) showed baseline viral load taken at diagnosis is an effective way to identify people transferring care and pretending to be ART-naive and 2) demonstrated that dolutegravir, an HIV integrase inhibitor used to treat HIV, is extremely effective at suppressing pediatric viral loads in Zambia (U.S. Postdoctoral Trainee, Consortia II)
- Had their syphilis research directly inform the China National Syphilis Prevention and Control Plan. As a result, pregnant women in China are now routinely screened for syphilis (U.S. Postdoctoral Trainee, FICRS)
- Participated in national and regional boards as a scientific and technical advisor in several initiatives to implement nutrition policies such as food labelling, food marketing targeted to children and fiscal measures on unhealthy food. As a member of the Guatemalan National Technical Board, the trainee helped write the Bill #5504 “Promotion of Healthy Eating” to support the Ministry of Health on the prevention of overweight, obesity and NCD´s. The Bill aims at regulating the food environment in Guatemala implementing a front-of-package labelling and food marketing regulations (LMIC Postdoctoral Trainee, Consortia II)

While global health research is imperative for the prevention, diagnosis and treatment of diseases that span the globe, it is the translation of this research into international and national practice and policy that ultimately saves lives. Although anecdotal, alumni are helping inform, conduct, or implement changes in health policy and practice.

3.2.4 Other Accomplishments

Aside from the traditional research outputs such as publishing and securing future research funding, there are other achievements that F&S alumni are being recognized for including:

Awards

- Asian Women of Achievement Awards in Science in 2019 (LMIC Predoctoral Trainee, FICRS)
- 'Thought Leader' and featured in the 100 most influential in UK-India Relations in 2019 (LMIC Predoctoral Trainee, FICRS)
- Young Investigator Award by the Kenya National AIDS Control Council in 2017 (LMIC Postdoctoral Trainee, FICRS)
- Elsevier Foundation Award for early-career women scientists in the developing world in 2016 (LMIC Predoctoral Trainee, Ellison)
- Women in Innovation Award from Universidad Peruana Cayetano Heredia in 2018 (LMIC Predoctoral Trainee, Ellison)
- Presidential Award for Meritorious Achievement (2019) for taking part in the care and separation of Siamese twins at the University Teaching Hospital in Zambia (LMIC Postdoctoral Trainee, FICRS)
- Emerging Leader in International Infectious Diseases by the International Society of Infectious Diseases, USA in 2016 (LMIC Predoctoral Trainee, Ellison)
- Lift Global Health Leader USA 2020 Cohort (U.S. Postdoctoral Trainee, Consortia I)
- Medium's One of 50 Experts to trust during COVID (LMIC Postdoctoral Trainee, FICRS)
- TIME magazine's 100 most influential for 2022 (LMIC Postdoctoral Trainee, Consortia II)

New labs, departments or divisions

- Founded the Africa Centre for Systematic Reviews & Knowledge Translation, College of Health Sciences, Makerere University, Uganda (LMIC Predoctoral Trainee, FICRS)
- Created Lupus Genomics and Global Disparities Unit at NIAMS, NIH Stanford/Gates Foundation Women (U.S. Postdoctoral Trainee, Consortia I)
- Launched a non-profit to improve patient care (Mail Medical Relief Fund). This includes work to renovate and build Mali's first and only pediatric burn unit (U.S. Predoctoral Trainee, Ellison)
- Established an Observatory of Migration and Health together with UPCH and the Ministry of Health, to monitor trends and access to services following the vast Venezuelan migration (LMIC Postdoctoral Trainee, Consortia I)
- Developed a Heart Failure with Preserved Ejection Fraction and Cardiac Amyloidosis Program at Mount Sinai (U.S. Predoctoral Trainee, FICRS)
- Collaborated with a senior colleague to establish the HIV Cure Research Infrastructure team at the Noguchi Memorial Institute for Medical Research (LMIC Postdoctoral Trainee, Consortia II)
- Created the Infectious Diseases Research Institute at a Bolivian University (LMIC Predoctoral Trainee, Ellison)
- Founded the Center of Excellence for Non-communicable Diseases and Nutrition research at BRAC University in 2017 (LMIC Postdoctoral Trainee, Consortia I)

Committees

- Member of the Association of Public Health Laboratories Infectious Disease Committee. As a committee member this alumna had a national impact on SARS-CoV-2 testing response, and have acted as a subject matter expert on SARS-CoV-2 testing for the Wisconsin Department of Health Services (U.S. Postdoctoral Trainee, Consortia I)

- Chair of the Global Engagement Committee of the American College of Rheumatology and organized the first Global Rheumatology Summit in 2021 (U.S. Predoctoral Trainee, Ellison)
- Member of the Malawi Ministry of Health's Family Planning Sub-Committee, as well as its National Cervical Cancer Program Steering Committee (U.S. Postdoctoral Trainee, Consortia I)
- Chair of the Pediatric Infectious Diseases Society (PIDS)'s International Affairs Committee for the past few years. Under this role, this former U.S. postdoctoral trainee successfully created a global health conference as part of the annual St. Jude/PIDS conference, provided scholarship opportunities for trainees, and established collaborations with pediatric infectious diseases societies around the globe. (U.S. Postdoctoral Trainee, FICRS)

3.3 Trainee Employment

Seventy-seven percent (or 529 respondents) stated that their current employment is in the same research area as their training research. The major emphasis of all types of employment was research (59%), followed by clinical (23%), and then teaching (16%).

> As a Malawian, I have seen a lot of suffering and poverty is one of the social determinants [o]f health. Being from a resource constrained country…we are aware that most of the research opportunities is being given to those from high income countries. I have a passion to make a difference in my county at [a] policy level and I believed that if … given an opportunity to participate in this fellowship, I [would] definitely make progress towards alleviating the suffering of [the] vulnerable population in Malawi ... this Fellowship has taught me a lot and I'm proud to be among this cohort.
>
> LMIC Postdoctoral Trainee, 2021

The majority of responding alumni reported going into the academic sector (n=451; 66%); this held true across gender and country of origin (U.S. versus LMIC) (Table 10). Sixty-six percent of all male and female respondents are working in academia, followed by government (20% of all males and 16% of all females) (Table 9). They both reported staying in global health (77% males; 69% females) and were either doing research (58% males; 60% females) or clinical work (21% males; 23% females) (Table 10).

Notable differences between U.S. and LMIC respondents included employment in the government. LMIC respondents were more likely (n=73; 22%) to work in government than their U.S. counterparts (n=48, 14%). The majority of LMIC and U.S. respondents (59% for both) stated their position entailed research. However, nearly 30% (n=103) of U.S. individuals were doing clinical work, compared the 16% of LMIC individuals. LMIC respondents were more likely than their U.S. counterparts (24% versus 9%) to be teaching or training individuals in their current job.

Table 9: Survey Response to Employment Sector

	U.S.	LMIC	Male	Female	Total
Academia	257 (73%)	194 (59%)	201 (66%)	250 (66%)	451 (66%)
Government	48 (14%)	73 (22%)	60 (20%)	61 (16%)	121 (18%)
For Profit/Industry	22 (6%)	13 (4%)	11 (4%)	24 (6%)	35 (5%)
Not for Profit	26 (7%)	51 (15%)	32 (11%)	45 (12%)	77 (11%)
Answered	**353**	**331**	**304**	**380**	**684**
Unknown	**2**	**4**	**2**	**4**	**6**

Table 10: Survey Response to Emphasis of Position

	U.S.	LMIC	Male	Female	Total
Research	210 (59%)	198 (59%)	177 (58%)	227 (60%)	408 (59%)
Clinical	103 (29%)	52 (16%)	63 (21%)	87 (23%)	155 (23%)
Policy/Consulting	22 (6%)	17 (5%)	18 (6%)	21 (6%)	39 (6%)
Training/Teaching	32 (9%)	80 (24%)	58 (19%)	53 (14%)	112 (16%)
Administrative	10 (3%)	13 (4%)	9 (3%)	12 (3%)	23 (3%)
Answered	**353**	**333**	**305**	**381**	**686**
Unknown	**2**	**2**	**1**	**3**	**4**

Examples of jobs include:

- President of the National Council Board on Rare Disease for the Peruvian Ministry of Health
- Chief Clinical Officer for the largest refugee clinic in Memphis, Tennessee
- Lieutenant commander with the Marines and served in NYC during the initial COVID outbreak
- Director of Mamás del Río (Mothers of the River), a social innovation program that aims to improve maternal and newborn health in rural and remote areas of the Peruvian and Colombian Amazon region through the training of community health workers empowered with technology.
- A U.S. President's Malaria Initiative Resident Advisor to Kenya that is responsible for a $35M annual budget to prevent and control malaria in the country by advising the Government of Kenya on disease control policies and program implementation.
- Founder and current co-director of the American Continent Global Health Seminar, a consortium of nine dental schools from different countries across the American continents (Peru, Argentina, Chile, Colombia, Panama, El Salvador, Costa Rica, Mexico, and U.S.)
- First female executive director of the largest tertiary national referral hospital called Muhimbili National Hospital in Tanzania
- Founding associate director of Office of Global Health Equity at Morehouse School of Medicine
- Associate director of the Center for Clinical Research and Implementation Science at the College of Medicine, University of Lagos
- National mumps expert that currently works as the (first ever) correctional health coordinator in the Office of Health Equity in the CDC National Center for HIV, Viral Hepatitis, STD, and TB Prevention

While most respondents continue to work in a career pertaining to global health (56%), there were 152 (21%) respondents stating that they did not continue in global health. Looking at just the 102 U.S. respondents who reported leaving the field of global health (Table 11), the main deterrent was the time commitment to field work and/or travel that is necessary when working in global health (51%). About a third of the respondents noted financial considerations (36%), including lack of funding opportunities in global health or loan repayment considerations. Only three individuals (3%) stated that they did not pursue a career in global health due to a loss of interest in global health. While this is promising, it suggests that barriers to global health careers for U.S. individuals is not due to a lack of interest, but for other reasons, some beyond the control of the individual or NIH's ability to assist.

Table 11: Survey Response for Reasons U.S.-Only Alumni Did Not Continue in Global Health

	Medical student	Non-medical or pre-doctoral student	Post-doctoral student	Male	Female	Total
Family or other personal issues made travel and field work difficult	28	8	17	21	31	52, 51%
Financial considerations	12	2	23	10	25	37, 36%
Pursued a non-research career path	21	6	10	14	22	37, 36%
Competing scientific interests	16	4	8	15	13	28, 27%
Lost Interest	1	2	0	0	3	3, 3%
Answered	**44**	**14**	**44**	**38**	**62**	**102**

3.4 Recommendations from Survey Respondents

To address some of the challenges brought up by survey respondents the following recommendations may be considered for future iterations of the program:

Research: Lower-than-expected research productivity was a common complaint for respondents during their training year. Some of the perceived curtailment may have resulted from unrealistic expectations on what can be accomplished in a one-year research project. One survey respondent admitted, "our project was overly ambitious and not sufficiently focused, in retrospect." However, beyond managing expectations, there are research preparations that when completed beforehand can increase the likelihood of a productive research year. Suggested preparatory activities include hiring the local research team, preparing for IRB/ethics review, and developing the research protocol. One respondent noted that "coming in prepared, with a full research protocol already created prior to the fellowship, allowed … successful use [of my] time." Another recommended approach to encouraging a productive research start and training year is to design a research project that is linked to ongoing research at the LMIC institution.

Reimbursement: Many respondents disclosed their dissatisfaction with issues related to funding and reimbursement during the training year. To mitigate the perceived disparity in financial support during the training year, respondents suggested adjusting the stipends according to the cost of living for that country rather than a universal amount. Other recommended changes are to allow for the financial support of publication costs resulting from research carried out during the training year and a no-cost extension of unused research and training funds after completion of the training year. While frustration stemming from bureaucratic delays in money transfers from U.S. to LMIC institutions is not unique to the F&S Programs, there was still a demand to create financial mechanisms, so trainees are not subjected to long delays in the disbursement of funds or reimbursement.

Mentors: Mentoring is a key component of the F&S Program. As such, respondents expressed that high quality mentoring requires accountability by regular assessment of mentors' performance and

commitment (i.e., interest and availability) to the program. Similarly, the program should create better incentives to help retain quality mentors, while encouraging other mentors to perform better. For example, mentors with a track record of successful mentorship should be nominated to host trainees or be more involved in other aspects of the recruitment or program.

LMIC Trainees: Survey respondents expressed concern that the training experience differed for trainees from the U.S. versus LMICs. One suggestion to offset these perceived discrepancies includes providing an opportunity for LMIC trainees to visit a U.S. institution; this will allow the international trainee an opportunity to have more contact with mentors, to learn a different research culture, and to build long term relationships for future collaboration. Another suggested area for equal opportunities between U.S. and LMIC trainees includes access to research resources (e.g., free journals).

Peer Networks: Many respondents noted that "support meetings" where current trainees can discuss their experiences, challenges, career paths, future funding possibilities, and global health research topics would enhance bonding and networking. Alumni recommended visits to other trainees at LMIC institutions or regional meetings to further enhance networks formed during the training year. Others imagined a scenario, like the pre-2012 "twinning," where each research training institution had at least two trainees, either in the same field or at the same professional level, with whom they could share their training experiences. Alternatively, trainees could be paired with other researchers at the LMIC institution who were at the same level but with different backgrounds or experiences.

After completion of the training year, there also were recommendations to promote new and sustained alumni networking and collaborations such as a symposium or reunion for former trainees, a communication platform (e.g., newsletter, message board, etc.) that would provide updates on the community or research opportunities, a professional database of past and current trainees, and alumni research travel grants to engage with current trainees, mentors, or collaborators. Also mentioned was transitioning trainees into research mentors - even peer mentors – to keep alumni engaged. Peer mentoring allows the program to leverage the unique resources from a recent trainee who could share recent experiences and solutions with incoming trainees. One respondent recalled "I had a good network ... because a lot of fellows were already working in Peru, so I had a lot of help. But I know many of my colleagues did not benefit [from] having a network of other fellows in country, which delayed their work."

Extend Training Time: As shared in Section 3.1, survey respondents felt that adding another six to 12 months to the existing training period would enable trainees to carry out a robust research project, publish research findings, secure future funding, and establish long-term collaborations.

4.0 Conclusions and Future Directions

The findings from the surveys suggest the F&S Program may have influenced the careers of many alumni that continued beyond their one year of research training. As shown by the survey results, many F&S alumni successfully transitioned into independent researchers who have secured subsequent research funding and remained in the field of global health. Many alumni have maintained personal and professional relationships with their U.S. and LMIC counterparts, including mentors.

4.1 Current Status

In 2022, the latest cycle of the F&S Program, named *Launching Future Leaders in Global Health (LAUNCH) Research Training Program,* was competed and awarded. Retaining many features of its predecessor, Consortia II, LAUNCH was awarded to NPGH, UJMT, GHES, GloCal, and HBNU, with the addition of two new consortia, INSIGHT, led by the University of Maryland-Baltimore, and ACHIEVE, led by Washington University in St. Louis.

Over the iterations of the F&S Program and continuing with LAUNCH, the program has sought to be more inclusive and more equitable. For example, in successive NOFOs, there was an emphasis on broadening access to and participation of diverse groups in the U.S. by recommending the inclusion of U.S. institutions that have shown a historical commitment to educating students from groups underrepresented in biomedical research. To create a more equitable training experience for LMIC trainees, LAUNCH training programs now offer LMIC trainees short-term (i.e., 1 to 3 month) research training and skill development activities at U.S. institutions or, with rare exceptions, at other LMIC institutions that offer exceptional and strategic training opportunities. While abroad, LMIC trainees have an opportunity to expand their global understanding of research and health through experiences that advance their development of intercultural competence, appreciation of indigenous knowledge, acquisition of special skills, and growth from alternative research practices. They also will equally benefit from networking with new and different health professionals and potential future collaborators in the U.S.

All LAUNCH training programs benefited from the consortia's prior experiences directing research training programs. As such, many of the challenges mentioned above were addressed in the design of the renewed or new training program. Many programs continue to engage and support trainees after completion of their training year, deemed the "alumni guarantee" by one consortium, through continued career development trainings and methodological support, peer networking opportunities, small research grants, and access to remaining funding for associated publication costs and conference travel. Many programs also acknowledged the need to streamline compensation and reimbursement of trainees to prevent financial burden and research delays by providing advanced payment for purchasing research materials, along with direct deposit for quick reimbursement. As for the reported disparities in stipend, the amounts for U.S. trainees are based on established NIH stipend levels for predoctoral and postdoctoral trainees. For LMIC trainees, stipend levels are based on local standards, as determined in consultation with LMIC partners to ensure appropriate and equitable amounts.

The F&S program has been known by many names. Nevertheless, with each change, the driving force remains the same: to inspire health professionals and researchers worldwide to pursue a career in global health research. Over the past two decades, the F&S program has influenced the careers of hundreds of young scientists, sparking their interest in global health by enabling them to conduct hands-on research in LMICs. The program's impact has reached around the globe while transforming the lives of many of its over 1,400 alumni.