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Characterizing the Role of International Graduates of the Epidemic Intelligence Service in Increasing the Epidemiological Capacity and Diversity of the United States Public Health Workforce

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Abstract

Context: A trained and diverse public health workforce is needed to respond to public health threats. The Epidemic Intelligence Service (EIS) is an applied epidemiology training program. Most EIS officers are from the United States, but some are from other countries and bring unique perspectives and skills.

Objectives/Evaluation: To characterize international officers who participated in the EIS program and describe their employment settings after training completion.

Design: International officers were people who participated in EIS and who were not US citizens or permanent residents. We analyzed data from EIS's application database during 2009–2017 to describe officers' characteristics. We used data from the Centers for Disease Control and Prevention's (CDC's) workforce database for civil servants and EIS exit surveys to describe jobs taken after program completion.

Main Outcome Measures: We described the characteristics of the international officers, jobs taken immediately after program completion, and duration of employment at CDC.

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The authors declare that they have no conflicts of interest.

The findings and conclusions in this review are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Human Participant Compliance Statement: This investigation was reviewed by the Centers for Disease Control and Prevention and conducted in accordance with its policies and applicable federal law (45 CFR part 46.102(l)(2), 21 CFR part 56; 42 USC §241(d); 5 USC §552a; 44 USC §3501 et seq).

Results: Among 715 officers accepted in EIS classes of 2009–2017, 85 (12%) were international applicants, with citizenships from 40 different countries. Forty (47%) had 1 or more US postgraduate degrees, and 65 (76%) were physicians. Of 78 (92%) international officers with available employment data, 65 (83%) reported taking a job at CDC after program completion. The remaining took a public health job with an international entity (6%), academia (5%), or other jobs (5%). Among 65 international officers who remained working at CDC after graduation, the median employment duration was 5.2 years, including their 2 years in EIS.

Conclusions: Most international EIS graduates remain at CDC after program completion, which strengthens the diversity and capacity of CDC's epidemiological workforce. Further evaluations are needed to determine the effects of pulling away crucial talent from other countries needing experienced epidemiologists and to what extent retaining those persons can benefit public health globally.

Keywords

applied epidemiology; Epidemic Intelligence Service; international public health officers; public health practice; public health training

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The Epidemic Intelligence Service (EIS) is a 2-year service and learning program established in 1951 by the US Centers for Disease Control and Prevention (CDC). EIS was established to train postgraduate health professionals in the practice of applied and field epidemiology.[1] From 1951 to 2022, the program has trained 4033 officers, including doctoral-level scientists, nurses, physicians, veterinarians, and allied health care professionals (dentists, pharmacists, etc), to respond to public health events domestically and internationally.[2] During their training, EIS officers learn applied epidemiology by working at assigned host sites at CDC, other federal agencies, or state, local, or territorial health departments.[3] EIS officers respond to outbreaks and address both communicable and noncommunicable diseases, including occupational and environmental exposures, unintentional and intentional injuries, and public health disasters and emergencies.[4–6]

Approximately 65 to 80 officers are accepted into the EIS program every year. Primarily, EIS officers are US citizens or permanent residents. A limited number of international officers have been accepted each year since 1967.[7] The initial objectives for including international officers in the EIS program were as follows: (1) to increase the epidemiological workforce capacity in other countries, and (2) to improve and strengthen CDC's epidemiological workforce with highly skilled professionals with different backgrounds and skills (eg, languages, cultural competence, and experience working in international settings).[7,8] EIS leadership has long believed that having international officers makes CDC more fully equipped to support the agency's global public health mission.[7,8]

Although multiple benefits exist to including international officers in EIS, this inclusion also creates important challenges that the program must address. The selection process for EIS is a highly competitive and rigorous process that requires multiple levels of application reviews and interviews. Academic transcripts from institutions outside the United States report course work and performance in different formats, making a systematic assessment of those transcripts difficult. During interviews, candidates were required to

travel to Atlanta, Georgia, for in-person interviews, which can result in substantial costs to the candidates. Although since the COVID-19 pandemic started in 2020, selection interviews have been conducted virtually and might continue in this format indefinitely. In addition, multiple administrative processes must be followed when recruiting an international officer,including language, visa, and tax requirements, resulting in an increased and complicated administrative burden.

We assessed the jobs international officers assume after completing EIS training to help determine whether we are meeting our 2 long-standing goals of contributing to diversity in CDC's and the US public health workforce, while building global epidemiological capacity. Considering whether we are achieving these goals and the benefits and challenges of training international EIS officers is important for guiding internal recommendations for recruiting international officers. The evaluation objectives were to characterize international officers who participated in the EIS program and describe their employment settings after program completion.

Methods

An international applicant or officer was defined as a person who applied or was accepted to EIS and who was not a US citizen and not a permanent resident at the time of EIS program application. We characterized international EIS applicants and officers by analyzing data from EIS's application database. Each year, candidates submit their applications through the fellowship management system (FMS) online application platform. FMS was implemented for the EIS class that started in 2009, so our analysis was limited to the EIS classes that started the program from 2009 through 2017. EIS application data were entered by each applicant and included information such as country of citizenship, education, self-reported language proficiency, and professional history. We grouped countries of citizenship by World Health Organization (WHO) regions and described the number of officers who reported speaking WHO official languages.[9] EIS defines a qualifying degree as one that is required for the applicant to qualify for admission to the program. We classified professional backgrounds into the following categories based on their qualifying degree: doctoral scientists, nurses, physicians, veterinarians, and other health care professionals. Applicants with multiple qualifying degrees were classified in the following order: physician, veterinarian, allied health care professionals, and doctoral scientist. For example, a physician with a PhD or doctor of public health (DrPH) degree would be categorized as a physician. We further assessed their educational background to determine the proportion who had obtained 1 or more postgraduate degrees from a US academic institution before starting EIS. After candidates have accepted their admission to the program, they are matched and assigned to a host site for their 2-year training. We also reviewed FMS data regarding host site assignments where international EIS officers were matched for EIS.

We used 2 data sources to describe employment settings after program completion. One source for employment information was the CDC workforce database. The database is maintained by the Office of Personnel Management and is the primary personnel data system for all federal civil servants at the US Department of Health and Human Services. This database includes information such as CDC user identification (that we used to

identify EIS graduates in the system), name, citizenship status, employment status, start, and separation dates. We obtained these data as of November 9, 2020. A second data source came from exit surveys completed by officers for the EIS classes that started in 2009 through 2017. In these exit surveys, data are collected about the officers' experience in the program and information about the jobs they will take after completing the program using one of the following categories: CDC, other federal government, state or local health department, nongovernmental agency, academia, additional training or education, clinical setting, industry, and international public health. The "additional training or education" category included degree or residency programs, fellowships, and postdoctoral research positions. We categorized jobs as "government not otherwise specified" if information about the type of government body (ie, international, federal, local, or state) employing the officer was unavailable.The "unknown" category was recorded for those who did not take the survey, and information about their next job was unavailable.

When analyzing employment data, we categorized their first job as being at CDC if the CDC workforce database indicated that the officer remained at the agency after program completion, regardless of what they reported on the exit survey. However, because some EIS officers remain in their host sites after completion of EIS on a short-term basis, we only considered their first job as being at CDC if the fellow worked for 6 months or more in the agency immediately after program completion. Exit survey information was used if the CDC workforce database did not indicate the person had remained at CDC after program completion.

We also determined the percentage of international EIS graduates who stayed at CDC for 1 year or more after program completion.We know that several international EIS officers had already attended academic education and training in US institutions, and we hypothesized that these individuals might be on a path to remain in the United States, so we stratified the analysis of international officers staying 1 year or more at CDC by those who had a US postgraduate degree before starting the EIS program and those who did not. To examine the duration of CDC employment after program completion, we used information on separation dates from the CDC workforce database. Data were right-censored because the length of available follow-up data was different for different EIS classes.[10] We used a Kaplan-Meier survival analysis to describe the median duration of employment at CDC, including time spent in the program. Right-censoring occurs when we do not know the date of departure, only that it is after some known date (in our case, after the time when data were collected) or there was no follow-up with the participant.[11] All officers entered the analysis at the same point (when they started the program) and contributed time until the officer either left CDC (event = departure, with the time of the event being the date of separation) or were censored (had not left CDC by the end of the follow-up period on November 9, 2020).[12] We assumed that all officers stayed in continuous employment at CDC until either the separation date or up to November 9, 2020. We made this assumption because we did not have detailed information regarding job changes, and transitions out of and back into CDC are challenging and uncommon for people who are not US citizens or permanent residents. We also assessed whether holding a US postgraduate degree (obtained before starting the program) was associated with an international EIS fellow remaining at CDC after program completion.

Results

There were 4383 completed applications submitted for EIS classes of 2009–2017. Of those, 826 (19%) were offered admission and 715 (87%) accepted. Among 4383 completed applications, 1452 (33%) were from international applicants (mean per year = 161; range, 116–201) (Figure). After application reviews, interviews, and selection processes, 93 (2%) international applicants were offered admission and 85 (91%) accepted. On average, each class had 9 international officers (range, 6–12).

Among the 85 international officers, 44 (52%) self-identified as men and 65 (76%) were physicians. Forty (47%) officers reported 1 or more postgraduate degrees from a US academic institution. Among those with a US academic institution, 29 (73%) reported having a master of public health (MPH) degree, 13 (33%) reported having a PhD or DrPH degree, and 11 (28%) had other degrees (eg, doctor of medicine, doctor of science, master of science, or master of science in nursing). These numbers are not mutually exclusive because some officers might report having an MPH, PhD, or a master of science degree, all from US academic institutions.

International officers reported 40 different countries of citizenship, representing all 6 WHO regions. The largest proportion of international officers came from Africa (27%), Europe (24%), and Western Pacific regions (21%). They self-reported proficiency (good or excellent in speaking, reading, and writing) in 18 different non-English languages. French was the most common language (21%), followed by Arabic (7%) and Mandarin (7%) (Table 1).

During the EIS classes of 2009–2017, 13 (15%) international officers were assigned positions in the state, local, or territorial health departments and 72 (85%) were placed with positions at headquarters across all CDC national centers. The centers most frequently hosting international fellows were the National Center for Immunization and Respiratory Diseases (18%), National Center for Chronic Disease Prevention and Health Promotion (14%), Center for Global Health (12%), and National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (12%). Opportunities for international projects were available in varying degrees across all assignments.

Information concerning employment after completing program completion was available from CDC’s employment database or EIS exit surveys for 78 (92%) international officers. The first job after EIS was at CDC for 65 (83%) persons and at international entities outside the United States for 5 (6%). We did not have data regarding whether jobs with international entities were with the international officer’s country of citizenship. Of the remaining 8 international officers, 4 (5%) reported pursuing jobs in academic institutions as faculty or staff, 1 (1%) at another US federal agency, 1 (1%) at a government not otherwise specified, 1 (1%) in a nongovernmental agency, and 1 (1%) in a clinical setting.

Sixty-five (76%) international graduates worked at CDC for 6 months or more after completing the EIS program (Table 2).Among these international officers recruited at CDC after completing EIS, as of November 9, 2020, a total of 32 (49%) were still working at CDC whereas 33 (51%) had separated from the agency. Using Kaplan-Meier survival

estimates, the median time at CDC, accounting for censoring, was 5.2 years (range, 3.9–7.4 years).

Among the 85 international officers in the classes of 2009–2017, a total of 40 (47%) had a US postgraduate degree, of which 33 (83%) stayed at CDC after completing EIS (Table 3). Among the 45 (53%) without a US postgraduate degree, 32 (71%) remained working at CDC after completing the EIS program. After starting work at CDC,31 (94%) graduates with a US postgraduate degree stayed for 1 year or more compared with 29 (91%) with no US postgraduate degree.

Discussion

Based on our data review, CDC is the first employer after EIS for 76% of international EIS officers who completed the program. The proportion of EIS officers recruited by CDC after program completion has steadily increased over the last 3 decades, regardless of their citizenship status,[1] and is similar among US citizens and international applicants. Reasons for having international officers in the EIS program have included building epidemiological workforce capacity in other countries,[7,8] increasing diversity of experiences and perspectives of the EIS cohorts, and foreign language skills. Based on our evaluation, questions remain about whether EIS is building epidemiological workforce capacity internationally. The program might be drawing talent and expertise away from other countries to CDC, given that most international officers remain at CDC after program completion. Based on our findings, most international EIS graduates do not return to their country to serve direct roles in improving the epidemiological workforce capacity of their countries, at least within 5 years after completing EIS. Only a limited number reported returning to their country of citizenship to work within the Ministry of Health. When international EIS graduates returned to their country, usually agreements between CDC and the country's Ministry of Health were made in advance for this goal. In 2021, the EIS program piloted a new initiative to recruit and retain international EIS officers in their country of origin. For this initiative,we allowed CDC County Offices to nominate international applicants from their respective countries, particularly physicians who might not hold a US medical license and allowed them to apply to EIS. If accepted, these international candidates agreed to remain working at the nominating CDC Country Office for at least 2 years immediately after program completion.

Other epidemiology training programs modeled after EIS have been established worldwide and are likely a more efficient and direct way to build local capacity in applied epidemiology.[13] Some of these programs that train field-based public health professionals worldwide include the Field Epidemiology Training Programs (FETPs), under the general network of the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET), and Public Health Schools without Walls, among others. TEPHINET was founded in 1997 with support from WHO, CDC, and the Fondation Merieux.[14] FETPs are an example of more efficient programs for successfully building local international capacity in applied epidemiology and are now available in approximately 85 countries.[15,16] TEPHINET has completed multiple on-the-ground quality improvement initiatives since its creation through worldwide FETP memberships under its network.[17] Although TEPHINET

is the only global network of applied epidemiologists, it has steadily strengthened global public health capacity by supporting professionals locally in field epidemiology through training, service, and networking opportunities.[18] FETPs have also been successful in monitoring global health security, finding and reducing health threats at the source, and increasing countries' ability to detect and respond to outbreaks before they become epidemics.[19,20] We believe having qualified candidates apply and be accepted in their local FETPs is a more effective way of building international applied epidemiology capacity versus having those same candidates train and remain at CDC.More importantly, FETPs usually create a career pathway for their graduates, with high retention rates in the ministries of health.[21,22] Since 1980, more than 3900 trainees have graduated from advanced FETPs worldwide and more than 19 000 from all FETP tiers, significantly more than the number of international. candidates that could ever be trained within the EIS program.[15] Short international fellowship rotations at CDC could also be considered in efforts to enhance international capacity in specific skills.

Another reason for including international officers in the EIS program was to improve and strengthen CDC's epidemiological capacity. Our findings showed that international EIS officers have important expertise and language skills and are valuable contributors to CDC's global mission. In addition, we found that international officer graduates with citizenships from all of WHO's regions strengthen CDC's workforce by increasing the diversity and cultural backgrounds of the current workforce, serving a crucial goal in addressing concerns of diversity and inclusion within the public health workforce.

Our findings are subject to multiple limitations. First, not all international EIS officers responded to the exit survey and information regarding the first jobs after EIS is not complete. CDC's workforce database was used to supplement data from the exit survey; however, we did not have similar data for other employment settings. Second, we did not have information about whether international officers who took employment outside the United States returned to their countries. We also lacked information on whether international graduates who did not stay at CDC had a desire and intention to stay in the agency but could not remain for some reason. Similarly, there could have been some international graduates who wanted to return to their home country but were not able for some external reason. Third, the analysis was limited to 9 classes (2009–2017), and we only had data for a limited time after program completion. Finally, this evaluation did not assess the contribution international officers make to CDC or public health, as we did not describe their participation in epidemiological investigation, outbreaks, and other responses, publications, or other fundamental public health activities.

Conclusions

EIS trains multiple international officers each year. More than three-fourths of international officer graduates remain at CDC after completing EIS; only a limited number return to their country of origin after program completion. The international EIS graduates who obtain jobs at the CDC help the agency fulfill its mission and increase the diversity of CDC's public health workforce.[3] We will continue to accept a small number of international candidates for EIS and evaluate the current initiatives being piloted in CDC Country Offices to retain

graduates in their country of origin. Inclusion of international officers strengthens diversity of CDC's EIS cohorts and ultimately CDC's epidemiological workforce. However, based on our findings, including international candidates in the EIS program is not an effective way to build global epidemiological capacity, which was one of the primary reasons to train international officers within EIS. In this ever-changing world with continuously emerging diseases and pandemics, a need exists to focus on more domestic or regional programs that will train and retain epidemiologists to strengthen the public health workforce. Based on our data, CDC's support of global FETPs and TEPHINET is a more direct way to train and strengthen the applied epidemiological capacity of the international public health workforce.

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Implications for Policy & Practice

- The agency will continue to accept a small number of international candidates for EIS, and evaluate the current initiatives being piloted in CDC Country Offices to retain graduates in their country of origin.
- The agency might also consider short international training rotations at CDC with the aim of enhancing international capacity in specific skills.

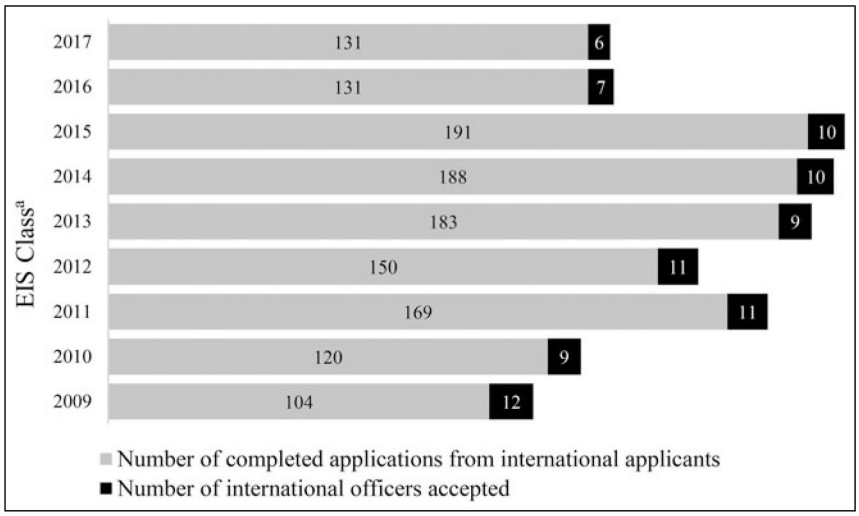

FIGURE.

Number of Completed Applications from International Applicants and Number of International Officers in the EIS Classes of 2009–2017

Abbreviation: EIS, Epidemic Intelligence Service.

[a] If an applicant applied in multiple years and updated his or her citizenship information between applications, only the most recent information entered is available. Therefore, in a limited number of cases, the citizenship information on record might not accurately reflect the citizenship status of the applicant at the time of application.

TABLE 1

Characteristics of International Epidemic Intelligence Service Officers for Classes of 2009–2017 (N = 85)

Characteristics	No.	%
Professional background		
Physicians	65	76
Scientists	14	16
Other health care professionals	4	5
Veterinarians	2	2
Education		
Any postgraduate degree from a US institution	40	47
Qualifying degree from a US institution[a]	17	20
Reported non-English languages spoken[b]		
French	18	21
Arabic	6	7
Mandarin	6	7
Spanish	4	5
Russian	4	5
At least one other language	30	35
Countries of citizenship grouped by WHO regions		
Africa	23	27
Europe	20	24
Western Pacific	18	21
Americas	11	13
Southeast Asia	7	8
Eastern Mediterranean	6	7

Abbreviation: WHO, World Health Organization.

[a]qualifying degree is a degree that is required to be eligible to apply to the Epidemic Intelligence Service.

[b]Good or excellent self-reported proficiency in speaking, reading, and writing during fellowship application.

TABLE 2

Description of Service of International Officers Remaining at CDC After the EIS Program for the Classes of 2009–2017 as of November 9,2020; Current Versus Noncurrent Employee

	EIS Class									
	2009–2011	**2010–2012**	**2011–2012**	**2012–2014**	**2013–2015**	**2014–2016**	**2015–2017**	**2016–2018**	**2017–2019**	**Total**
International officers in class	12	9	11	11	9	10	10	7	6	85
International officers hired at CDC after completing EIS	10	5	9	8	7	8	7	7	4	65 (76%)
Still at CDC as of November 9, 2020	2	2	2	4	3	7	3	5	4	32 (49%)
No longer at CDC as of November 9,2020	8	3	7	4	4	1	4	2	0	33(51%)
International officers are never hired at CDC after completing EIS	2	4	2	3	2	2	3	0	2	20 (24%)

Abbreviations: CDC, Centers for Disease Control and Prevention: EIS, Epidemic Intelligence Service.

TABLE 3

International Officers With or Without a US Postgraduate Degree Remaining at the CDC After the EIS Program, Classes of 2009–2017

	Classes of 2009–2017(N = 85)							
	Stayed at CDC		Stayed at CDC for at Least a Year		Did Not Stay at CDC		Total	
	No.	%	No.	%	No.	%	No.	%
US postgraduate	33	83	31	94	7	18	40	47
No US postgraduate	32	71	29	91	13	29	45	53
Total	65		60		20		85	

Abbreviations: CDC, Centers for Disease Control and Prevention; EIS, Epidemic Intelligence Service.