Survey of Graduates of the Epidemic Intelligence Service as an Approach to Enhancing Ethnic Diversity Among the Nation's Epidemiologists

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Synopsis

A survey was conducted to improve the recruitment, training, and retention of epidemiologists in the Epidemic Intelligence Service (EIS) Program of the Centers for Disease Control. The authors compared minority graduates of the program and nonminority graduates in several areas: reasons for application, degree of satisfaction, appropriateness of preparation for epidemiologic practice, and current professional activities.

A closed-ended questionnaire was mailed to all 87 minority graduates from the program during the period 1970–88, and to 172 randomly selected nonminority graduates. Of 259 graduates surveyed, 234 or 90.3 percent returned the questionnaire—89.6 percent of minority graduates and 90.7 percent of nonminority graduates. Virtually all graduates were satisfied with their EIS experience (95.2 percent), have encouraged others to apply (96.1 percent), and are the most frequent sources of initial contact of prospective officers (38.2 percent).

Most EIS graduates (71.2 percent) were still working in epidemiology. Compared with the nonminority graduates, the minority graduates were more likely to be women and to be single. Minority graduates were less likely than nonminorities to hold academic appointments (44.2 percent versus 60.0 percent) and less likely to work in academic settings as their primary job (11.5 percent versus 18.7 percent). At the same time, minority graduates were more likely to have learned of the EIS Program from academic advisors (32.1 percent versus 19.4 percent).

Graduates express high levels of satisfaction with the EIS Program and continue to practice epidemiology following graduation. Few differences between the minority and nonminority graduates were found. Because fewer minority graduates are in academic settings to serve as mentors or role models, alternative recruitment methods must be developed to sustain a high level of interest among minority groups in the EIS Program.

THE SUPPLY of epidemiologists in the United States falls as much as 7,000 persons short of the estimated number needed during the next 20 years to ensure the quality of health promotion and disease and injury control programs (*1*). The demand for epidemiologists has increased in the Federal Government, as well as in State and local health departments (*2*). The Epidemic Intelligence Service (EIS) Program was established at the Centers for Disease Control (CDC) in 1951 as a combined training and service experience in the public health practice of epidemiology (*3*). EIS Officers serve 2 years of active duty in the Public Health Service, providing service while learning applied epidemiology. More than 1,900 professionals have served in the EIS, including 77 officers in the class of 1991 (*4*).

The EIS Program plays an important role in meeting the increased national demands for epidemiologists. While there are several graduate school programs in epidemiology, the emphasis on applied training addressing actual health problems at the local, State, and international levels is unique to the EIS Program. Most EIS graduates continue the practice of epidemiology in their professional careers, especially in public service in State and local

health departments, as well as in the Federal Government.

Minority includes U.S. citizens who are racially or ethnically classified as black, Hispanic, Asian American-Pacific Islander, or American Indian-Alaska Native. More than 30 non-U.S. citizens have been EIS Officers, but they are not counted as U.S. minorities. Minority and nonminority populations in the United States continue to have substantial disparities in their health experiences compared with the general U.S. population. At the same time, these groups are underrepresented in the health professions, including epidemiology (*5*). Before 1970, only five minority men and no minority women had completed the EIS Program (table 1). During the next 19 years, 100 minority officers completed the program.

The purpose of this study was to obtain information that would assist in the recruitment, training, retention, and placement of minority EIS Officers. A survey was designed to compare minority and nonminority graduates of the EIS Program and examine their reasons for applying, their satisfaction with the EIS experience, the importance of the EIS Program in their choice of professional career, and their current professional activities.

Background

The emphasis in the training of EIS Officers is on the development of epidemiologic judgment—the reasoning process that stresses the systematic and rational use of data for making public health decisions. Most EIS Officers are assigned to positions at CDC headquarters in Atlanta, GA, or at one of its seven field stations located around the country. Additionally, about 25 percent of the officers in each class are assigned to State or local health departments, and a few are assigned to epidemiology positions in other Federal agencies.

EIS Officers have played important roles in landmark epidemiologic investigations, including identification in 1955 of the lot of killed poliovirus vaccine contaminated with live virus, investigation of the definitive epidemic of Legionnaires' disease in 1976, identification of tampons as a risk factor for toxic-shock syndrome, and investigation of the first cluster of cases of what was later to be called the acquired immunodeficiency syndrome (AIDS) (*6*). Officers have been involved increasingly in the investigation of noninfectious disease problems, including the initial demonstration of the association between maternal exposure to isotretinoin during pregnancy and severe birth defects, the documented increased risk of injury associated with the use of all-terrain vehicles, the cause of a cluster of deaths related to flour inadvertently contaminated with parathion, and an investigation of unexplained deaths of hospitalized patients (*6*). In 1989 and 1990, EIS Officers were instrumental in investigating the role of L-tryptophan in the development of the eosinophilia-myalgia syndrome.

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Historically, approximately 85 percent of EIS Officers have been physicians (*4*). In recent years, many officers have also earned master's-level degrees in epidemiology or public health before they enter the EIS Program. Additionally, veterinarians, nurses, dentists, graduate epidemiologists, statisticians, social scientists, and persons in other professional categories have completed the EIS Program.

Methods

Sample. Demographic data on and addresses for the graduates of the EIS Program were obtained from the "EIS 1990–1991 Directory," a directory that is updated each year at CDC on the basis of information volunteered by the graduates. Minority status was based initially on available records and confirmed in the survey as reported by the graduate.

Survey. The questionnaire included 45 questions in four areas: demographic information, educational background, EIS experience, and current employment. Most questions were closed-ended, and many had the potential for multiple responses. A pilot survey completed by 13 of 15 graduates (4 minority and 9 nonminority) randomly selected from a listing of all graduates for the years 1970–88 resulted in minor revisions in questionnaire format. A revised questionnaire was then sent to the remaining 82 minority graduates for the years 1970–88 and to 162 randomly selected nonminority graduates for the same years. This 2-for-1 sampling approach in-

Table 1. Number of Epidemic Intelligence Service officers from racial and ethnic minority[1] groups by period of entry into the program

Racial-ethnicity	1951–69		1970–79		1980–89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Blacks	1	0	14	2	18	14	33	16
Hispanics	1	0	5	0	10	6	16	6
Asians	3	0	8	1	8	12	19	13
Native Americans	0	0	1	0	1	0	2	0
Totals	5	0	28	3	37	32	70	35
Percent of all EIS Officers	1		7		11		6	

[1] Official classification categories published by the Office of Management and Budget.

cluded all the minority graduates for this period and 20 percent of the nonminority graduates.

Because some addresses were not current, several methods were used to follow up nonrespondents: (*a*) current addresses were obtained from the American Medical Association, (*b*) persons who did not respond within 4 weeks were telephoned and sent a second letter and a questionnaire, and (*c*) persons who did not respond in 2 months were sent a certified letter and a questionnaire. Before the survey, the total sample size of 259 was calculated to yield a power of 80 percent or more for detecting a difference of plus or minus 20 percent based on a response rate of 50 percent or more for the nonminority group.

Statistical analyses. In multiple-option questions, similar responses were combined unless noted otherwise (for example, "very satisfied" and "satisfied"). We compared minority to nonminority officers to calculate 95 percent confidence intervals and P values in univariate analyses. Statistical significance was based on $P < 0.05$. Results from the pilot survey were included in the final analyses.

Results

Demography. Of the 259 EIS graduates surveyed, 234 (90.3 percent) returned the questionnaire, 78 of 87 (89.6 percent) of the minority graduates and 156 of 172 (90.7 percent) of the nonminority graduates. As a group, the graduates were primarily men (78.1 percent), married (78.1 percent), and earned less than $100,000 (63.9 percent). The minority graduates reported themselves to be black (47.4 percent), Asian American (29.5 percent), or Hispanic (23.1 percent).

EIS experience. Most differences between minority graduates and nonminority graduates found in the survey were not statistically significant. Of the respondents, 34.6 percent of minorities and 40.0 percent of nonminorities most frequently became aware of the program through EIS graduates, and 38.5 percent of minorities and 36.1 percent of nonminorities became aware from professional colleagues or friends. Journal articles (7.7 percent) and program announcements (4.5 percent) were infrequently cited as sources by either group. Only half the graduates indicated some familiarity with CDC or the EIS Program before the introduction that led to their submitting an application. The most frequently cited attractions of the EIS Program for both minorities and nonminorities were the opportunity to work at CDC (33.3 percent and 29.0 percent) and the opportunity to obtain training in epidemiology (33.1 percent and 33.5 percent) or public health (15.4 percent and 20.0 percent). Following their EIS experience, 29.7 percent of minorities versus 31.7 percent of nonminorities completed CDC's Preventive Medicine Residency Program.

Both minority (96.1 percent) and nonminority (95.5 percent) EIS graduates reported satisfaction with the EIS experience and have encouraged others to apply (97.4 percent and 95.5 percent, respectively). For many elements of the EIS Program, the graduates expressed very high levels of satisfaction—fewer than 1 in 10 expressed any dissatisfaction with the assignment location, the program area of the assignment, relevance of the assignment to future career activities, travel requirements, or interaction with their peers.

About 70 percent of both minority and nonminority graduates have attended at least one of the Annual EIS Conference meetings, a 5-day meeting which includes scientific presentations by both current officers and graduates—36 percent have attended the conference each year since they completed the program.

A small proportion of both minority and nonminority graduates had specific areas of concern. These included how well the EIS experience prepared each officer for the practice of epidemiology (11.5 percent of minorities and 11.2 percent nonminorities indicated not so well), some dissatisfaction with a supervisor (13.9 percent minorities and 18.5 percent nonminorities), and some dissatisfaction with formal course instruction (20.3 percent minorities and 22.1 percent nonminorities). Dissatisfaction was greatest for the quality of mentoring, expressed by 27.4 percent minorities and 19.3 percent nonminorities, and the quality of the didactic training (24.3 percent minorities and 22.1 percent nonminorities).

Current employment. Both minority (84.6 percent) and nonminority (86.4 percent) graduates found the EIS experience to be an important element of their professional development. Most EIS graduates—both minority (73.1 percent) and nonminority (70.3 percent)—are still working in epidemiology. Overall, women are more likely than men to still be working in epidemiology (92.2 percent versus 65.4 percent, respectively); this difference was observed for both minority and nonminority graduates. Among officers from classes in the 1980s, 91.5 percent of female graduates and 82.0 percent of male graduates were still working in epidemiology. No longer practicing epidemiology were 26.9 percent of minorities and 29.5 percent of nonminorities; many in both groups chose their current careers because of a desire to return to caring directly for patients (28.6 percent and 31.9 percent, respectively), although minority graduates were less likely than nonminority graduates to do so because of interest in other professional areas (19.0 percent versus 40.4 percent, respectively).

Many minority and nonminority graduates of the EIS Program currently work at CDC (37.8 percent), in other Federal agencies (11.2 percent), or in State or local health departments (7.7 percent) (table 2). Most others work in clinical practice (19.7 percent), academic settings (16.7 percent), industry (3.4 percent), or some combination of these. Minority and nonminority graduates (94.9 percent) were equally satisfied with their current jobs.

Minority and nonminority differences. Several statistically significant differences existed between minority and nonminority graduates. Minority graduates were more likely than nonminority graduates to be women (33.3 percent versus 16.1 percent, respectively) and more likely to be single, separated, or divorced (35.9 percent versus 14.8 percent). Minority graduates were significantly more likely than nonminority graduates to be made aware of the EIS Program by academic advisors (32.1 percent versus 19.4 percent) and CDC recruiters (12.8 percent versus 4.5 percent).

Table 2. Current employment by percent of 78 minority and 156 nonminority graduates of the Epidemic Intelligence Service Program, Centers for Disease Control Atlanta, GA, 1970–88

Current employment	*Minority*	*Nonminority*
Centers for Disease Control	48.7	34.6
Other Federal agencies	11.5	9.0
State or local health agencies	6.4	8.3
Clinical settings	15.4	21.8
Academia	10.3	17.9
Industry	5.1	2.6
Other	2.6	5.8

As EIS Officers, minority graduates had been less likely than nonminority graduates to be assigned to State or local health departments (21.8 percent versus 39.4 percent). As officers, minority graduates had been less likely than nonminority graduates to express satisfaction with peer interaction (78.0 percent versus 87.5 percent), being more likely to indicate a "neutral" opinion about this question (17.8 percent versus 7.6 percent) and less likely to be "very satisfied" (30.1 percent versus 50.3 percent).

Minority graduates are less likely than nonminority graduates (44.2 percent versus 60.0 percent) to hold academic appointments and somewhat less likely to work in academic settings as their primary job (11.5 percent versus 18.7 percent). Finally, minority graduates were less likely than nonminority graduates to report an annual salary of $100,000 or more following EIS (26.3 percent versus 41.1 percent).

Because minority graduates were more likely to enter EIS in the 1980s than the 1970s (11.5 percent versus 3.0 percent, respectively, of EIS classes in these two periods), we stratified analyses by time to control for potential confounding related to changes in the EIS Program, as well as shorter careers following the EIS experience. For example, officers were much less likely to be women in the 1970s than the 1980s (4.1 percent versus 34.6 percent).

Similarly, while minority graduates from both decades are less likely to report an annual salary of $100,000 or more, the difference is not statistically significant when stratified by period of entry into

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the EIS Program. Although all categories of recent graduates are more likely to have never married than graduates from earlier years (22.1 percent versus 7.2 percent), minority graduates are more likely than nonminority graduates to be single in the 1980s (30.2 percent versus 16.9 percent).

Differences in rates of assignment to State health department positions and satisfaction with peer interactions existed in both decades but were increased in the 1980s. Finally, the decreased likelihood for minority graduates compared with nonminority graduates to hold academic affiliations is more striking in the 1980-89 cohort (34.0 percent versus 51.8 percent) than the 1970-79 cohort (66.7 percent and 69.4 percent).

Discussion

A dramatic need exists for more epidemiologists working at various levels of public health throughout the United States (*1*). This need is particularly important as the nation sets out to achieve the health promotion and disease and injury prevention objectives for the nation set forth in "Healthy People 2000" (*7*). Increasingly, the number of members of minority groups in essential public health disciplines such as epidemiology is an enabling factor in reaching those objectives (*5*). The EIS experience complements academic training, including that offered in schools of public health. As a result, the EIS Program has increasingly attracted graduates of master's and doctoral programs in epidemiology, public health, and the social and behavioral sciences (*4*).

EIS graduates expressed a high level of satisfaction with the program. As might be expected by this finding, most graduates continue to interact with CDC and the EIS Program through recruitment of new officers and attendance at program activities such as the Annual EIS Conference. Another important finding is the satisfaction of EIS graduates with their current work, which usually encompasses epidemiologic practice. Many graduates of the program currently work at CDC or other public health agencies.

An unexpected difference in the EIS experience of minority officers is a lower likelihood of assignment to the State or local health departments than for nonminority officers. The reason for this difference is unclear. In the assignment process, State health departments have a very active role in selection of officers, and it is conceivable that in some way they were less likely to select officers who are members of minority groups. On the other hand, officers who are members of minority groups may have a stronger preference for assignments at CDC headquarters than for these types of assignments. It will be important to investigate the reasons for this difference as increasing numbers of members of minority groups are recruited into the EIS Program.

The discrepancy in degree of satisfaction with peer interaction is also difficult to interpret, since all of this difference can be accounted for by the increased likelihood of expressing a neutral (as opposed to negative) opinion about this question. In other settings, minority students have had a decreased likelihood of social interaction outside of the school, which may be related to an attitude about school or training as a place of formal learning, rather than a social environment (*8*). This finding is particularly striking since minority officers are more likely to be assigned to Atlanta and, as a result, are more likely to have more fellow officers around with whom to interact. At the same time, EIS assignments have diversified with the expanded mission of CDC, and officers are now situated in geographically dispersed sites around Atlanta. These changes tend to decrease the interaction of all EIS Officers in Atlanta.

The decreased likelihood that minority graduates will hold academic appointments and work in academic settings has several implications for recruitment. While the reasons for this finding are unclear, it has an important impact on the recruitment of EIS Officers, because its earlier graduates are the primary source of recruitment for EIS. Because of active recruitment efforts in recent years, CDC has successfully recruited members of minority groups into the EIS Program. Minority representation was 17 percent in the 1990 EIS class and 26 percent in the 1991 class.

Since fewer minority graduates are in academic programs, fewer mentors or role models exist for minority students in these settings. As a result, members of minority groups are more likely to contact deans or visiting CDC recruiters as their

primary source of information about EIS. CDC is actively working with minority health professions schools as well as schools with large numbers of minority students to complement traditional recruiting efforts. Other mechanisms such as publication of articles in journals with large minority readerships should increase awareness of the EIS Program among minority students (*9*).

Members of minority groups who have graduated from the EIS Program are more likely to be women and to be single. This may reflect differences in mobility and age, but it may also reflect preferences for a public health career among female members of minority groups and among single persons, as well as trends in enrollment in both colleges and health professions schools. The increased number of members of minority groups who are single mostly reflects the younger age of these graduates.

Because relatively few EIS Officers are members of minority groups, it was not possible to draw inferences on the variety of ethnic subgroups that make up the minority population (for example, Hispanics of Cuban, Mexican, or Puerto Rican heritage). Further analysis of the survey data is under way to describe the experiences of these racial and ethnic subgroups of EIS graduates. It will be important for effective targeting of recruitment and retention efforts, however, to examine the experiences of these subpopulations in future cohorts to gain a better understanding of the variability of their backgrounds as well as their experiences as EIS Officers.

The orientation of the EIS Program toward the practice of epidemiology should be especially attractive to minority epidemiologists interested in addressing issues in minority health. To recruit these epidemiologists, greater efforts must be made to match minority officers to assignments in State and local health departments. In addition, the EIS Program must enhance its efforts in professional development and placement for all officers, particularly those who are members of racial and ethnic minority groups.

The opportunities and responsibilities for meeting the nation's changing health challenges are particularly suited to the unique style of epidemiology that is practiced by EIS Officers. The EIS Program has evolved rapidly, changing its training and experience to respond to new demands in subject matter, analytic methods, computerization, and populations served. In recognition of the needs for members of minority groups in the practice of epidemiology, CDC has successfully increased the number of officers with different racial and ethnic backgrounds.

To help respond to the nation's need for epidemiologists, the EIS Program must continue to integrate concepts of applied epidemiology into new program areas in chronic disease, injury control, and occupational and environmental health. To address the need for epidemiologists from racial and ethnic minority groups, CDC must continue to develop a recruitment process that fosters interest among potential candidates from minority groups and to make efforts to target specific underrepresented groups such as minority men.

Ultimately, the continued successful recruitment of minorities into the EIS Program will depend on the quality of the EIS Officers' experience. As has been the case for other EIS graduates, these men and women will prove to be the most important recruiters in the future. Finally, the program must also continue to modify the EIS experience to reflect the training needs of future officers.

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