Fifty Years of Epidemiology at the Centers for Disease Control and Prevention: Significant and Consequential

Jeffrey P. Koplan1 and Stephen B. Thacker2

The Epidemic Intelligence Service (EIS) was the vision of Alexander Langmuir, who developed a program with a vital mission to address an unmet need in the United States. The Communicable Disease Center, now the Centers for Disease Control and Prevention (CDC; Atlanta, Georgia), and the EIS steadily expanded from focusing on infectious disease to address chronic diseases, health statistics, occupational and environmental health and safety, injury prevention and control, and reproductive health. Langmuir recognized the need for epidemiologists to collaborate with others, initially from the laboratory and later including veterinarians, demographers, statisticians, nutritionists, behavioral and social scientists, industrial hygienists, and sanitarians. These partnerships stimulated the further evolution of the EIS Program to include sophisticated statistical analysis, economics, and the tools of the behavioral and social sciences. A mixture of analytical rigor and practical application characterizes the practice of epidemiology at CDC and in the EIS. Thus, the “significant” in the title of this paper refers to the analytical rigor of the public health approach and the validity of the results, while the “consequential” reflects the practical application of the results, trying to make a difference in health outcomes. Am J Epidemiol 2001;154:982–4.

The year 2001 marks the 50th anniversary of the Epidemic Intelligence Service (EIS), a training program initiated in 1951 at what was then known as the US Communicable Disease Center. The program has thrived and has contributed significantly to public health, and it continues to do so at the Atlanta, Georgia, Centers for Disease Control and Prevention (CDC), as the agency is titled currently, producing nearly 2,500 trained field epidemiologists. These graduates have gone on to important leadership and scientific positions in federal, state, and local government; in the private sector; in academia; in international health agencies; and in clinical care. This paper describes the origins of the EIS Program and how it has influenced the practice of epidemiology not only at CDC but also in the United States and around the world.

ORIGINS OF THE EIS

Alexander D. Langmuir was an Associate Professor of Epidemiology at the Johns Hopkins University School of Hygiene and Public Health in Baltimore, Maryland, when he moved to Atlanta and joined the CDC as Chief Epidemiologist in 1949. Two years later, he initiated the EIS Program to provide “adequate epidemiologic facilities to investigate outbreaks of disease in strategic areas. A broader but equally pressing need is to make available competent epidemiologists to assist in the planning and organization of the total civil defense program at all levels” (1, p. 236).

The program was designed to provide a cohort of trained field epidemiologists available at all times and dedicated to surveillance of infectious diseases and their swift control in outbreak situations. His model, and thus CDC’s, was not cut out of whole cloth. Rather, it used elements of US, English, and continental European public health thought and experience.

From English epidemiologic tradition, Langmuir incorporated elements of the theories and practices of John Graunt, Edwin Chadwick, William Farr, John Snow, and John Simon (2, 3). Langmuir considered Farr the father of disease surveillance (4). As superintendent of the statistical department of the registrar general’s office in the mid-19th century, Farr collected and analyzed disease data and took public health action based on the findings. During the same period, Chadwick was an advocate for prevention and for the poor. He also required accurate statistical information as a basis for action. Snow, of course, is the prototype of the
analytical outbreak investigator and decisive action taker. Simon, Chief Medical Officer of Health for London in 1855, put together a team of physicians to investigate matters concerning public health, including epidemic investigations.

But the continental tradition in public health also influenced the EIS. Pierre Charles Alexandre Louis emphasized the need for statistical methods in medicine and taught Farr (2). The “medical police” that Austrian Johann Peter Franck envisioned in 1779 would serve as government practitioners of preventive medicine and public health, and medical police laws were passed in several European nations (3).

Public health developments in the United States beginning in the late 19th century also influenced Langmuir (2, 3). Charles Chapin, for 48 years the distinguished health officer of Rhode Island, based infectious disease control on epidemiologic principles that we still use. His picture and those of John Snow and Edwin Chadwick graced Langmuir’s office wall, illustrating their profound influence on the EIS. Wade Hampton Frost, the first professor of epidemiology in the United States at the Johns Hopkins University School of Hygiene and Public Health, had been a teacher of Langmuir. Frost emphasized the need to build on quantitative foundations for public health and the need to link data acquisition with practical application. Although he narrowly restricted his definition and concept of epidemiology to infectious diseases, his English contemporary, Major Greenwood at the London School of Hygiene and Tropical Medicine, took a more expansive view, encompassing non-communicable diseases and injuries.

CDC and the EIS steadily progressed from the Frost model with its infectious disease focus (the era of the Communicable Disease Center) to the current Centers for Disease Control and Prevention, where EIS Officers and CDC programs address chronic diseases, health statistics, occupational and environmental health and safety, injury prevention and control, and reproductive health, in addition to the full spectrum of infectious diseases. Langmuir’s genius was to combine these concepts and practices into an institutionalized program with a vital mission to address an unmet need; a congenial institutional home with supportive services; and a dedicated, usually reliable budget.

FEATURES AND CONTRIBUTIONS OF THE EIS

The EIS Program is based on training through service. It is an apprentice program analogous to postgraduate medical education but focuses on populations rather than individual patients. In the early years of the program, EIS Officers worked primarily on the surveillance and control of infectious diseases, conducting investigations on the major epidemic concerns of the times—polio, influenza, vectorborne diseases, foodborne diseases, and hospital-acquired infections. On occasion, Officers were called in to use their epidemiologic skills to address problems such as leukemia, childhood lead poisoning, and asthma, but it was not until the 1980s that expansion into these areas became widespread.

Langmuir recognized the need for epidemiologists to work in collaboration with others, and in the early years of CDC the major collaborators came from the laboratory. A major accomplishment was the institutionalization of this collaboration between epidemiologists and laboratory scientists at CDC, which has led to impressive achievements in the past 50 years. In subsequent years, EIS Officers worked with other disciplines with increasing frequency, and the scope of CDC’s responsibilities moved into environmental health, chronic diseases, population issues, injury prevention, and occupational safety and health. The first partnership within the EIS was formed between physicians and veterinarians, who brought an ecologic framework from their training and experience and a comfort with working with populations (i.e., flocks and herds) that was unusual for physicians. Later partners included laboratory scientists, demographers, statisticians, nutritionists, behavioral and social scientists, industrial hygienists, and sanitarians. These partnerships stimulated further evolution of the EIS Program to alter its training to include sophisticated statistical analysis, economics, and exposure to the tools of the behavioral and social sciences. Until the late 1970s, approximately 90 percent of each class was physicians; the others were primarily veterinarians and some other health professionals (e.g., nurses and dentists). Throughout the 1980s and 1990s, increasing numbers of postdoctoral graduates in epidemiology, sociology, anthropology, psychology, and similar disciplines joined the EIS. Now, nonphysicians represent approximately 30 percent of each new class. This mixture of disciplines and training has had a profound and salutary effect on EIS and CDC. Each Officer is introduced to and benefits from the skills that others in the class bring to solving problems of public health importance.

Physicians and nurses come from clinical settings that emphasize direct, one-on-one patient contact. The EIS experience adds a population-based perspective, joining the denominator to the clinicians’ numerator. The quantitative, analytical approach to solving public health problems parallels the recent focus on evidence-based medicine among clinicians. On the other hand, for the doctoral graduate coming from the academic world, the practical approach to public health problems at CDC stresses the utility of information in the real world and the need to make decisions based on the best available evidence, but often not all the evidence one might desire. These Officers experience the drive to apply knowledge to address a public health outcome in the context of public and political pressure. It is this mixture of analytical rigor and practical application that characterizes the practice of epidemiology at CDC and in EIS. Thus, “significant” in the title of this paper refers to the analytical rigor of the public health approach and the validity of the results, whereas “consequential” reflects practical application of the results, trying to make a difference in health outcomes.

Throughout the early years of CDC and the EIS, the primary external partners were state and local health departments, as CDC was the US government’s major link to these other members of the governmental public health community. Indeed, Langmuir was a key player in forming a national organization of state and territorial epidemiologists, the Conference (now Council) of State and Territorial Epidemiologists, as an affiliate of the Association of State and Territorial Health Officials. As CDC grew and its mission expanded, new partnerships were developed through-
out the world, not only within government but also with professional organizations, voluntary agencies, academia, foundations, community-based organizations, international organizations, and the private sector. EIS Officers have been key links to these new partners, often working with them in outbreak investigations and applying epidemiology to new public health problems or new intervention programs.

The EIS Program has served the United States and the world for five decades now. The exemplary work of EIS Officers reaches beyond the more than 10,000 investigations and visible contributions reported elsewhere in this issue of the Journal, including the work of current EIS Officers on a broad range of public health problems. The EIS has institutionalized the vision of Alexander Langmuir, who in turn built a program on the shoulders of great epidemiologists of the past. Its success is evident not only in the contributions of EIS Officers but also in their contributions to global public health during their subsequent careers. The success is also seen in the desire of countries around the world to emulate CDC and the EIS. Our vision is that EIS will continue to evolve, anticipating future public health challenges and defining further the program's unique role in assuring the health and safety of the world's citizens.

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REFERENCES