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The Training of Epidemiologists and Diversity in Epidemiology: Findings from the 2006 Congress of Epidemiology Survey

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PURPOSE: In the past decade, we have witnessed increasing numbers of individuals entering the field of epidemiology. With the increase also has come a diversity of training and paths by which individuals entered the field. The purpose of this survey was characterization of the epidemiology workforce, its job diversity, and continuing education needs.

METHODS: The Minority Affairs and Membership committees of the American College of Epidemiology (ACE) prepared and administered a workforce survey to identify racial/ethnic diversity, demographic background, workplace type, credentials, income, subspecialties, and continuing education needs of epidemiologists. The survey was self-administered to attendees of the Second North American Congress of Epidemiology in June 2006.

RESULTS: A sample of 397 respondents of the 1348 registered for the Congress was captured (29.5% response). Epidemiologists who participated were from 36 states and 18 countries; 54.6% were trained at the doctoral level; 19.1% earned $120,001 or more a year. A wide range of epidemiology subspecialties and continuing education needs were identified.

CONCLUSIONS: This preliminary snapshot of epidemiologists indicates a wide range of training mechanisms, workplace sites, and subspecialties. Results indicate a need for examination of the core graduate training needs of epidemiologist as well as responding to desired professional development needs through the provision of continuing educations efforts.

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KEY WORDS: Epidemiology, Professional Education, Racial and Ethnic, Training, Workforce.

INTRODUCTION

As a discipline, epidemiology has witnessed tremendous growth in size and diversity of content over the past two decades (1–5). The focus of epidemiology has evolved from description of diseases and exposures that lead to disease, to include genes, the environment, and social factors (5). The field of epidemiology has grown to encompass a number of subspecialties such as neuroepidemiology, pharmacoepidemiology, social epidemiology, psychiatric epidemiology, and genetic epidemiology (1, 4, 5). Although this growth has helped epidemiology to become a major factor in solving many of the public health problems of society, it has also led to the field becoming somewhat fractionated with a lack of standardization, raising the question of what are the fundamental competencies of the profession (5, 6).

The Institute of Medicine underscored that in the face of the public's immense reliance on public health (epidemiology in particular) to assist in the identification and containment of communicable diseases, environmental hazards, chronic disease and disaster preparedness it is necessary that more epidemiologists be trained in subdisciplines (1). However not only does public health face a workforce shortfall in its attempts to keep up with the need for trained epidemiologists, but it struggles with disparities in the number of racial/ethnic minority epidemiologists (7–10) entering the profession and completing doctoral degrees.

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Selected Abbreviations and Acronyms

ACE = American College of Epidemiology
MAC = Minority Affairs Committee
NSF = National Science Foundation
ASPH = Association of Schools of Public Health

In 1995, the Minority Affairs Committee developed for the American College of Epidemiology (ACE) a widely distributed and accepted Statement of Principles that "the profession of epidemiology needs to achieve racial, ethnic and cultural diversity, at all levels, in order to contribute fully to public health for all populations" (11). Within ACE, the Minority Affairs Committee (MAC) recommends "ways to increase representation of minorities in the profession of epidemiology, increase participation of minorities in the College, and improve the health status and risks of minorities and ethnic groups" (11).

The MAC has a long tradition of tracking the progress of racial/ethnic diversity in the field of epidemiology (7–10). To characterize the epidemiology workforce, its job diversity, and continuing education needs, the MAC and the ACE Membership Committee conducted a survey of attendees of the 2006 Congress of Epidemiology. The 2006 Congress of Epidemiology provided an unique opportunity to survey a wide range of epidemiologists since 18 professional epidemiology organizations sponsored or supported the meeting: the American Academy of Pediatrics-Epidemiology Section, American College of Epidemiology, American College of Preventive Medicine, American Diabetes Association-Council of Epidemiology & Statistics, American Epidemiology Society, American Public Health Association-Epidemiology Section, American Statistical Association-Statistics in Epidemiology, Canadian Society for Epidemiology and Biostatistics, Council of State and Territorial Epidemiologists, Eastern North American Region of the International Biometric Society, International Epidemiology Association, International Genetic Epidemiology Society, International Society for Environmental Epidemiology, International Society of Pharmacoepidemiology, Society for Epidemiologic Research, Society for Healthcare Epidemiology of America, Society for Pediatric & Perinatal Epidemiology Research, Society for the Analysis of African American Public Health Issues, and Western North American Region of the International Biometric Society. This work briefly describes results from the survey.

METHODS

The human subjects' protocol for this study was approved by the University of Maryland Institutional Review Board. All materials were designed by members from the American College of Epidemiology's MAC and Membership Committee. A scannable self-administered questionnaire was used to collect sociodemographic information, place of employment, subspecialty, and continuing education needs from attendees of the 2006 Congress of Epidemiology in Seattle Washington. The survey questionnaires were distributed at the ACE exhibit booth and took an average of 5 minutes to complete.

The survey consisted of predominantly multiple choice items to assess race and ethnicity, income, highest degree received, and other sociodemographic and employment characteristics. The categories for the place of employment question were based on categories used in the National Science Foundation (NSF) Survey of Doctoral Recipients. Broad categories were used to collect estimated total income for 2005 in U.S. dollars, and reduce item nonresponse. Respondents were asked to identify their epidemiology subspecialty from a list of 25 categories (e.g., cancer, cardiovascular disease, infectious disease), or write-in additional subspecialties in response to an "Other, specify" category. The survey introduction explained that participants could refuse to answer any or all of the questions; participation was completely voluntary. To maintain confidentiality, no identifiable information was collected in the survey.

Completed questionnaires were scanned and quality checks performed using Teleform (Version 5, Cardiff Software Inc. Solano Beach, CA). During analysis, frequencies were calculated and write-in responses summarized. Frequencies of race/ethnicity and place of employment were compared with data from other ACE reports (12–14) and the NSF Survey of Doctoral Recipients (2008). Workforce characteristics were compared with previously identified educational needs and competencies for the epidemiology workforce (6, 15–18).

RESULTS

There were 1348 registered attendees at the 2006 Congress of Epidemiology of which 397 participated in the survey (29.5% response). The only available descriptive information for all Congress attendees was address. This geographic information suggests that survey participants were similar to all Congress attendees: 84.6% of attendees were from the U.S. compared with 86.7% of survey participants. Attendees of the Congress represented 30 countries and 44 states, whereas participants in the survey represented 18 countries and 36 states.

Survey participants were between 23 and 84 years of age with a median age of 40 years (Table 1). Thirty-five percent (35.1%) were racial and ethnic minorities (19.4% Asian/Pacific Islanders, 7.4% African Americans, 7% Latinos, and 1.3% American Indian/Alaska Natives). Two-thirds (65.7%) were women. Almost half (46.4%) of respondents

TABLE 1. Sociodemographic and employment characteristics of the 2006 Congress of Epidemiology Survey (n = 397)

Sociodemographic/employment characteristic	Responses
Age	Range: 23–84 years Median: 40 years
Men	34.3%
Race	
White	71.9%
Black/African American	7.4%
Asian/Pacific Islander	19.4%
American Indian/Alaskan Native	1.3%
Hispanic or Latino Ethnicity	7.0%
Highest degree obtained	
Bachelor's	4.9%
Master's	27.5%
Doctorate	54.6%
Master's or Doctorate in Epidemiology	66.9%
Self-identify primarily as an epidemiologist	79.9%
Annual income	
$20,000 or less	7.0%
$20,001–$40,000	18.3%
$40,001–$60,000	15.9%
$60,001–$80,000	17.5%
$80,001–$100,000	14.5%
$100,001–$120,000	7.8%
$120,001–$140,000	4.8%
$140,001–$160,000	3.5%
$160,001–$180,000	5.1%
$180,001–$200,000	2.4%
$200,001 or more	3.2%
Employment sector	
Academia	46.4%
Industry	5.3%
Government	21.1%
Nongovernment organization	10.0%
Other (e.g., student, retired)	17.2%
Work in the United States	86.7%
Citizen in country where work	86.0%

TABLE 2. 2006 Congress attendees' epidemiology subspecialties by disease/physiological and methodological approach

Disease/physiological approach	n	Methodological approach	n
Aging/gerontology[a]	4	Behavioral[a]	1
Alcohol, tobacco, and other drugs/substance use[a]	2	Biomarker	3
Cancer	66	Biostatistics/methods development	19
Cardiovascular	8	Clinical	11
Disability[a]	2	Environmental/ occupational	43
Infectious disease	40	Genetic	13
Injury	6	Health Services[a]	2
Maternal and child health[a]	4	Infection control and hospital	5
Neuro-	7	Life-course	6
Noninfectious diseases[a]	1	Meta-analysis	0
Obesity/diabetes	12	Military[a]	1
Ophthalmic[a]	1	Molecular	1
Oral/Dental	2	Nutritional	13
Pediatric[a]	3	Pharmaco/device	15
Perinatal[a]	4	Population health[a]	3
Psychiatric[a]	5	Public health practice	22
Renal	1	Social	21
Reproductive	25	Spatial	2
Respiratory[a]	2	Surveillance/clinical surveillance	2
Sports/Physical activity[a]	1	Survey administration[a]	1
Veterinary/zoonosis/ human-animal interactions[a]	1		
Violence[a]	1		

[a]These subspecialties were provided in response to the "Other, specify" category. Respondents indicating two subspecialty areas for the "Other, specify" category were counted in both subspecialities. Some respondents also indicated nonepidemiologic subspecialties such as academic program coordinators, publishing, and philosophy; those few responses were not included

worked in academia, whereas 21.1% worked in government, 10% in nonprofit organizations, 5.3% in industry, and 17.2% in other places of employment. Eighty-seven percent of respondents worked in the United States, and 86% were citizens of the country in which they worked. Sponsoring organizations with the most members participating in the survey were the Society for Epidemiologic Research (44.3%), the American Public Health Association-Epidemiology Section (28.5%), and the American College of Epidemiology (23.2%) (data not shown). However, it should be noted that respondents may have had membership in more than one organization.

More than half of respondents (54.6%) reported a doctoral degree as their highest degree, whereas 27.5% reported a master's degree. Two-thirds of respondents had received their highest degree in Epidemiology. Other higher degrees mentioned included a wide range of fields (e.g., biostatistics, public health, environmental health, medicine, pharmacology, education/health promotion and psychology). The median estimated total income for 2005 in U.S. dollars fell within the $60,000–80,000 category, and 19.1% made $120,001 or more a year. Only 6.3% of respondents did not provide annual income information.

Many disciplines were represented in response to the epidemiology subspecialty question (Table 2). The most commonly reported subspecialties were: cancer, environmental/occupational, infectious disease, reproductive, public health practice, and social epidemiology. "Other" epidemiology subspecialties included: alcohol, tobacco and other drugs/substance use; disability, maternal and child health, noninfectious diseases; ophthalmic; perinatal; respiratory; sports/physical activity; violence; behavioral, health services; military; population health; and survey administration.

Approximately 8 of 10 participants (79.9%) self-identified primarily as an epidemiologist. We included those

respondents who did not consider themselves primarily epidemiologists in all analyses because they were active in the field of epidemiology as demonstrated by their attendance at the 2006 Congress, a major international epidemiologic meeting. Several participants who did not consider epidemiologist as their primary identification were members of prominent epidemiologic organizations (e.g., 9 were ACE members; 15 were members of the Society for Epidemiologic Research). Of those who did not view themselves primarily as epidemiologists, 25.4% had received a Master's or Doctorate degree in epidemiology (e.g., MD/MPH). Of respondents who received a Master's or Doctorate degree in epidemiology, 6.8% did not consider epidemiologist as their primary identification. There were, however, similarities between participants who self-identified primarily as epidemiologists and those who did not. Both groups had the same median age (40 years) and median income ($60,000–80,000). However, those who considered themselves primarily an epidemiologist were more likely to be female and a citizen in the country where they worked. Those who did not consider themselves primarily an epidemiologist represented a wide range of subspecialties of which the largest numbers were biostatistics (12%) and public health practice (10.7%).

Table 3 provides a summary of topics suggested by participants for future ACE, and other epidemiological (e.g., Society for Epidemiologic Research [SER], American Public Health Association) workshops and educational seminars. Fifteen topic areas were identified: children's health, chronic disease and cancer, community involvement/social aspects, diet and nutrition, health disparities, education, environment, ethics, genetics and biomarkers, global, infectious disease, policy, statistical and analytic methods, study design/procedures, and surveillance. By use of the recently released "Competencies for Applied Epidemiologists in Governmental Public Health Agencies" (15), public health practice competency domains were assigned to each of the 15 topic areas. For example, topics under community involvement/social aspects address three competency domains: analytic/assessment, community dimensions of practice, and cultural competency. Most of the requested educational topic areas (e.g., genetics and biomarkers, diet and nutrition) address the analytic/assessment and/or basic public health sciences domains. Education, ethics, and global topic areas address the domain of leadership and system thinking; policy workshop topics address the financial planning and management domain.

DISCUSSION

The main purpose of this survey was to characterize the epidemiology workforce, its job diversity, and continuing education needs. The American College of Epidemiology's strategic plan (2001) has identified two specific objectives that relate to continuing education of epidemiologists: "Continue to work with allied organizations to increase educational opportunities for epidemiologists and consumers of epidemiologic information;" and "Create opportunities to exchange ideas about education for epidemiologists" (19).

Continuing education opportunities are especially important for epidemiologists. A 2004 assessment conducted by the Council of State and Territorial Epidemiologists revealed that 48% of epidemiologists in state health departments had received no academic coursework in epidemiology (17). Twenty-nine percent of state health departments reported that fewer than half of their epidemiologists had participated in available training or education opportunities in 2003 (17). In 2006, one-third of state public health departments reported a need for additional training in all epidemiology competency areas (18). The greatest needs for additional training were reported in surveillance system evaluation and knowledge of environmental and behavioral science in epidemiology practice.

ACE continues to offer continuing education workshops at national meetings of epidemiologists. At the 2008 ACE meeting, workshop topics were ethics, genetics, evolutionary epidemiology, diabetes in minority groups, processes for obtaining National Institutes of Health grants, and policy developments. ACE workshops at the 2008 Society for Epidemiologic Research meeting covered writing and publishing research, meta-analysis, and evolutionary epidemiology. Since 2002, the MAC has offered annual full-day scientific workshops on health disparities topics as a way of providing training for racial and ethnic minority epidemiologists and others. Workshop topics to date included: "Community-Based Participatory Research with Native Americans and Latino Communities: Epidemiologists in the Community" (2002); "What Does an Epidemiologist Do? Implications of the Classification of Race and Ethnicity for Research on Health Disparities in Blacks, Asians, Native Hawaiians, and other Pacific Islanders" (2003); "Trust, Mistrust and Ethics in Health and Health Care Research with Racial/Ethnic Minority Populations" (2004); "Race and Pharmacogenomics: What is An Epidemologist to Do?" (2006); "Applying Epidemiologic Methods in the Hispanic Community Health Study: Study of Latinos (HCHS/SOL)" (2007); "Research Ethics in Studying Genes and the Environment in Diabetes among Ethnic Minorities" (2008); as well as the upcoming "Progress in Achieving Diversity in the Field of Epidemiology: Opportunities and Challenge" for 2009. (http://www.acepidemiology2.org/cttes/minorityaffairs/history.asp).

Findings from our survey can be used to help define necessary competencies for epidemiologists. Competencies are needed in the rapidly changing field of epidemiology in order

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TABLE 3. Suggestions for educational workshops/conferences/continuing education efforts

Topic	Suggestions	Relevant competency domains for Tier II applied epidemiologists[a]
Children's health	• Childhood cancer, acute leukemia in children	Skill Domain 1 - Analytic/assessment
	• Methodological issues in perinatal research	Skill Domain 2 - Basic public health sciences
	• Childhood obesity	Skill Domain 5 - Cultural competency
Chronic disease and cancer	• Rural causes of cancer	Skill Domain 1 - Analytic/assessment
	• Screening development	Skill Domain 2 - Basic public health sciences
	• Behavioral aspects of cancer prevention and control	
	• Identify chronic disease associations	
	• Chronic diseases- diabetes, cancer, cardiovascular	
	• Childhood cancer	
Community involvement/ social aspects	• Study design of community based participatory research	Skill Domain 1 – Analytic/assessment
	• Evaluate community level interventions	Skill Domain 4- Community dimensions of practice
	• Methods for life-course epidemiology	
	• Social epidemiology methods and measurements	Skill Domain 5- Cultural competency
	• Challenges in incorporating evidence based public health with community participation	
	• Social responsibility of epidemiologists in research question formulation	
	• Assess and address social determinants of health	
	• Use of epidemiologic process to improve health services	
	• Effects of social networks/ capital on health	
	• Quality of life	
Diet and nutrition	• Dietary assessment, intervention, and measurement error	Skill Domain 1 - Analytic/assessment
	• Obesity and childhood obesity	Skill Domain 2 - Basic public health sciences
	• Nutrition epidemiology measurement methods	
	• Gene/nutrient interaction	
Disparities	• Hispanic health	Skill Domain 1 - Analytic/assessment
	• Research methodologies in minority research	Skill Domain 2 - Basic public health sciences
	• Effect of economic disparities in health	Skill Domain 5 - Cultural competency
	• How to take knowledge of racial inequalities in healthcare and address disparities	
	• Studies of prison inmates	
	• Studies of disabled populations	
Education	• Education curriculum, texts used, evaluating students	Skill Domain 7 - Leadership and systems thinking
	• Career development, mentoring	
	• Teaching at undergraduate and graduate level, innovative teaching strategies	
	• Poster design	
Environment	• Air pollution and risk assessment	Skill Domain 1- Analytic/assessment
	• Gene-environment interactions	Skill Domain 2- Basic public health sciences
	• Effects of bacterial environment on health	
	• Epidemiology and the built environment/ Urban Planning	
Ethics	• IRB protocol and issues	Skill Domain 1 - Analytic/assessment
	• Ethical issues of epidemiologic databases: privacy, consent	Skill Domain 7- Leadership and systems thinking
	• Restriction in access of public and health records and data files	
	• Informed consent	
Genetics and Biomarkers	• Genetic epidemiology	Skill Domain 1 - Analytic/assessment
	• Genetics concepts for beginners	Skill Domain 2 - Basic public health sciences
	• Methods using biomarkers and immunologic markers, from the lab perspective	
	• Biomarkers of heavy metal exposure	
	• Molecular/genetic interactions	
	• Drug-gene interactions	
Global	• Opportunities for international collaborative projects	Skill Domain 1 – Basic public health sciences
	• Bioterrorism	Skill Domain 4 - Community dimensions of practice
	• Disaster preparedness/disaster outcomes	
	• Global health and sustainability	Skill Domain 7 - Leadership and systems thinking

(*Continued*)

TABLE 3. (Continued)

Topic	Suggestions	Relevant competency domains for Tier II applied epidemiologists[a]
Infectious Disease	• Re-emergence of infectious diseases • Interface of infectious disease and chronic disease (e.g. viruses in cancer) • HIV	Skill Domain 1 - Analytic/assessment Skill Domain 2- Basic public health sciences
Policy	• How to talk to media and legislators • Funding research, accessing foundation funding, National Institutes of Health funding • Organizing opportunities for epidemiologists to do advocacy • Translating research into policy • Policies, regulations on public health; use of epidemiology in public health and policy setting • Intersection between public health epidemiology, research, and practice • Policies in formulating standards protective of children • Open access publishing	Skill Domain 1 – Analytic/assessment Skill Domain 3 - Communication, Skill Domain 5 - Cultural competency Skill Domain 6 - Financial and operational planning and management Skill Domain 8 - Policy development
Statistical and analytic methods	• Statistical methods new to epidemiologists 5-10 years out of training • Novel analytical methods for epidemiology • Statistics and methods "hot-topics" • Statistical analysis of survey data • Bayesian analyses for epidemiologists and application to spatial analysis • Graphic data analysis • Simulation modeling of disease transmission • Multilevel/simulation modeling • Complex longitudinal and hierarchical modeling • Quantitative and Qualitative methods, developing quantitative instruments from qualitative research • CIS and GIS methods of analysis • SAS and other epidemiology software • Application of causal based modeling	Skill Domain 1 - Analytic/assessment
Study design/ procedures	• New techniques for observational studies that can improve the validity and integrity of observational studies • Sampling in rural areas • Methods in pharmaco-epidemiologic research • Conducting epidemiology research using government and community data • Measurement error—ways to deal with it • Unravel mechanisms of inequality thinking about discrimination that may be embedded in research design • New epidemiologic methods for field epidemiologists • Research methods on difficult to study populations • Social vs. clinical epidemiology studies • Evidence decision making and examples of evidence based prevention • Survey method development and challenges • Dissemination of results, presenting scientific research in the public arena • Data sharing and spreading results to participants • Occupational cohort methodology • Exploration of why random clinical trial results are at variance from cohort & case-control study findings • Quasi experiments • Data linkage	Skill Domain 1- Analytic/assessment Skill Domain 2 - Basic public health sciences Skill Domain 4 - Community dimensions of practice Skill Domain 5 - Cultural competency
Surveillance	• Syndromic surveillance • State/local health departments • Acute non-infectious disease surveillance	Skill Domain 2 - Basic public health sciences

[a]Public health practice competency domains identified by the Council on Linkages Between Academic and Public Health Practice.

to "provide a standard definition of what is usually done in the profession…and a way to measure the qualifications of candidates for the jobs we are trying to fill" (6). The Centers for Disease Control and Prevention and the Council of State and Territorial Epidemiologists have collaborated since 2004 to develop Competencies for Applied Epidemiologists in Governmental Public Health Agencies. Core competencies for public health professionals were identified by the Council on Linkages Between Academic and Public Health Practice: analytic/assessment; basic public health sciences; communication; community dimensions of practice; cultural competency; financial planning and management (operational planning, financial planning, management skills); leadership and systems thinking; policy development/program planning (15). In examining Table 3, our survey respondents suggested a wide range of topics that covered all of these core competencies.

In 2004, the Association of Schools of Public Health (ASPH) began developing a list of 10 core competencies that every MPH student should possess upon graduation (16). Policy and ethics workshop topic areas are of particular relevance to epidemiology core competencies for MPH graduates, and support lifelong learning in order to remain a master of public health. The ASPH competencies are based on skill areas and are less specific (e.g., developing a foundation in basic epidemiologic concepts), whereas the Competencies for Applied Epidemiologists in Governmental Public Health Agencies are based on knowledge areas that professionals should possess to perform their job. Both sets of competencies, the Competencies for Applied Epidemiologists in Governmental Public Health Agencies and ASPH's, are merely guidelines and are not static; these competencies will require constant review and modification as the field of epidemiology continues to grow and diversify even more in the future in order to respond to the complex public health challenges.

Another goal of the American College of Epidemiology has been to increase the racial and ethnic diversity of its membership. Data on race/ethnicity based on annual membership indicate increasing diversity (13, 14; unpublished data from the American College of Epidemiology, September 2008). In 2004, 83% of ACE members were white, 5% African American, 2% Hispanic/Latino, 8% Asian/Pacific Islander, and 1% other (14). Data from 2008 show greater diversity among ACE members: 70.5% of the 1054 members were white, 5.9% African American, 3.2% Hispanic/Latino, 9.7% Asian, 3.4% Native American, and 1.5% other race (unpublished data from the American College of Epidemiology, September 2008). MAC views this increase in diversity as related to the success of MAC scientific workshops (designed to increase visibility of ACE active involvement in racial and ethnic minority health issues, and attract racial and ethnic minorities interested in joining ACE), as well as other recruitment efforts within the College.

Racial/ethnic diversity of the 2006 Congress of Epidemiology survey respondents (71.9% white) was similar to the 2008 ACE membership (70.5% white); however, a lower proportion of men participated in our survey (34.3%) than the proportion reflected in the membership of ACE for 2008 (58.4%). It is important to note that the current survey was not limited to ACE members; only 23.2% of respondents were active members. The NSF conducts surveys on recent doctoral graduates of science, engineering, and health fields. The 2003 NSF Doctoral Survey found 79.4% of doctoral graduate recipients in the health field were white, 5.1% African American, 2.7% Hispanic, 11.8% Asian, and 0.8% American Indian/Alaskan Native (20). In 2006, the NSF Survey of Doctorate Recipients found 77% of life science graduates (including the health field) were employed in academia, 11% in for- or not-for-profit organizations, and 12% in the government (21). Our results were comparable with the NSF findings.

Salary information for epidemiology faculty at public and private institutions is collected and reported by the ASPH. During the 2006–2007 academic year, the median 11-month salary for assistant professors in epidemiology was $83,422 compared with $102,178 for associate professors and $152,810 for full professors (22). Although 46.4% of our survey respondents worked in academia, median total income for 2005 in U.S. dollars was lower, falling within the $60,000–80,000 income category. However, it is not clear whether the reported income was a 9- or 11-month salary for academic survey participants but, in general, salaries for Congress participants were lower than the average reported ASPH salaries.

Limitations in using our results to characterize the entire epidemiology workforce are the low response rate and convenience sample design. Respondents to our survey may not be representative of the entire epidemiology workforce or of those who attended the 2006 Congress of Epidemiology. However, our response rate compares favorably to the approximately 15% response to a recent survey of members of 13 participating epidemiology societies (23) , and survey respondents were similar to all Congress attendees regarding geographic location.

Findings from our survey are comparable to ACE membership data and NSF survey statistics; each indicates an increasing racial/ethnic diversity of epidemiologists over time with the highest percentage employed in academia. Our results can help provide the basis for determining future educational/training priorities for epidemiologists based on their felt need for competencies and skills that can assist them to stay current with the changing times and developments in the field. Results can be used in a variety of ways, including assisting ACE and other

epidemiological societies in planning scientific workshops and continuing education to meet expressed education needs of epidemiologists. The statistics on the growing numbers of doctoral and master's level racial/ethnic minority members can provide agencies and academia a basis for diversifying their workforces as well as their training curricula. Finally, these results can be used to help keep desired competencies for epidemiologists up to date as the field continues to expand and diversify.

As the 30th Anniversary of ACE approaches, it is especially important to review results of surveys such as the 2006 Congress of Epidemiology survey in order to provide the field with information about how the epidemiology workforce is changing, how to better meet continuing education needs of the workforce, and whether it is meeting its diversity goals. The Board of Directors of the American College of Epidemiology has approved a new workforce survey for its membership. We hope that other epidemiologic associations will also take such steps so that we may increase our knowledge of the training needs of epidemiologists necessary to meet the challenges and complex public health needs of the 21st century.

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