Epidemiology Core Competencies for Master of Public Health Students

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SYNOPSIS

Competency-based education for public health professionals has been recommended by the Institute of Medicine. The Association of Schools of Public Health has developed a set of academic core competencies that it recommends that all Master of Public Health (MPH) students should possess prior to graduation. This article discusses the processes and reasoning used by the workgroup that prepared the epidemiology subset of MPH core competencies that appear in the association's 2006 report. These academic core competencies are complementary to but distinct from the specialist competencies that students should develop in their major field. The authors emphasize the importance of ongoing refinement of the core competency model with participation from both public health academics and public health practitioners.

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In the 2002 report, "Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century,"[11] the Institute of Medicine recommended that public health education should be competency-based. Competency assessment has become a common way to measure performance in both academic and practice settings. A competency is defined as a "complex combination of knowledge, skills, and abilities demonstrated by organization members that is critical to the effective and efficient function of the organization."[2] In 2001, the Council on Linkages Between Academia and Public Health Practice (COL) disseminated a competency model for public health practitioners.[3] COL's competency model was framed as a set of workforce competencies, designed for public health professionals/practitioners already working in the field. Previous works in competency development have explained the difference between a workforce competency and an academic competency.[4] The Council on Education for Public Health (CEPH) now explicitly requires schools of public health and public health degree programs seeking accreditation to have clearly stated competencies that guide the development of their educational programs.[5,6]

This article reviews the background and processes involved in the preparation of the epidemiology portion of a set of Master of Public Health (MPH) core competencies, which were developed by the Association of Schools of Public Health (ASPH) to facilitate further implementation of competency-based programs in graduate public health education.[7]

THE ASPH MPH CORE COMPETENCY DEVELOPMENT PROJECT

In 2004, ASPH launched an initiative under the auspices of its Education Committee (Chair, Stephen Shortell, PhD) to develop an academic competency model for master's-level education in public health. The MPH Core Competency Development Project was a response to a number of forces, including: expansion of both the opportunities and challenges for graduates of MPH programs; recognition of the advantages conferred by competency-based approaches in other academic fields; increased emphasis on accountability in higher education; and recommendations from key national organizations.

For the purposes of the MPH Core Competency Development Project, the core competencies were defined as a unique set of applied knowledge, skills, and other attributes (KSOs), grounded in theory and evidence, that every MPH student should possess upon graduation. The MPH Core Competency Development Project was completed in August 2006, with approval from the ASPH Board, for 119 core competencies arrayed in 12 domains. The core competency domains fall into two categories. There are five domains that address the five traditional core areas of knowledge (Biostatistics, Environmental Health Sciences, Epidemiology, Health Policy and Management, and Social and Behavioral Sciences) currently required for MPH degrees offered by programs and schools accredited by CEPH, and seven interdisciplinary, cross-cutting domains (Communication and Informatics, Diversity and Culture, Leadership, Professionalism, Program Planning, Public Health Biology, and Systems Thinking) that were considered essential for contemporary public health practice. The relationship between traditional core domains and the interdisciplinary, cross-cutting domains is illustrated in Figure 1. A full description of the MPH Core Competency Development Project is available through ASPH.[7]

THE CORE COMPETENCY WORKGROUPS

Twelve workgroups aligned with the five traditional domains and seven interdisciplinary domains were convened in two phases of the project. All workgroups were asked to follow the same procedures, which are described later in this article. Workgroup members were nominated to the project by a school of public health dean or public health partner organization (the American Public Health Association, Association of State and Territorial Health Officials, or National Association of County and City Health Officials). From these nominees, chairs and cochairs for each workgroup were appointed by ASPH project leaders. The workgroup chairs were then asked to identify, from the nominees, a group of approximately 10 content specialists to serve as members of the core workgroup for their domain. Additional nominees were invited to serve on resource groups, utilized to obtain additional input and provide a second level of review for draft lists of domain competencies. The workgroups were assisted by a competency consultant—Judith Calhoun, PhD, University of Michigan School of Public Health. ASPH provided staff support for the workgroups.

Michel Ibrahim, MD, PhD (Johns Hopkins Bloomberg School of Public Health) and Michael Moser, MD, MPH (Akron Health Department and Northeastern Ohio Universities College of Medicine) were designated cochairs for the Epidemiology workgroup. The members of the Epidemiology Core Workgroup and the Epidemiology Resource Group are listed, with affiliations, in Figure 2.

Charge to the Epidemiology Workgroup

The Epidemiology Workgroup was charged with developing a consensus list of eight to 10 epidemiology competencies that every MPH graduate should possess upon graduation. Early in this workgroup's process, members recognized that a central concept in its deliberation was the distinction that these competencies were to be required of *every* MPH student upon graduation, regardless of background, specialization, or intended career direction. This distinction was critical throughout the deliberations of the Epidemiology Workgroup. While the focus of this workgroup was epidemiology, the members recognized that the purpose was not to define the competencies possessed by an epidemiology major or by a practicing epidemiologist. The question that framed their discussions was, "What epidemiology competencies are needed by every MPH graduate for effective public health practice and lifelong learning, whatever form or focus their public health practice may take?"

Figure 1. Association of Schools of Public Health core competencies graphic model

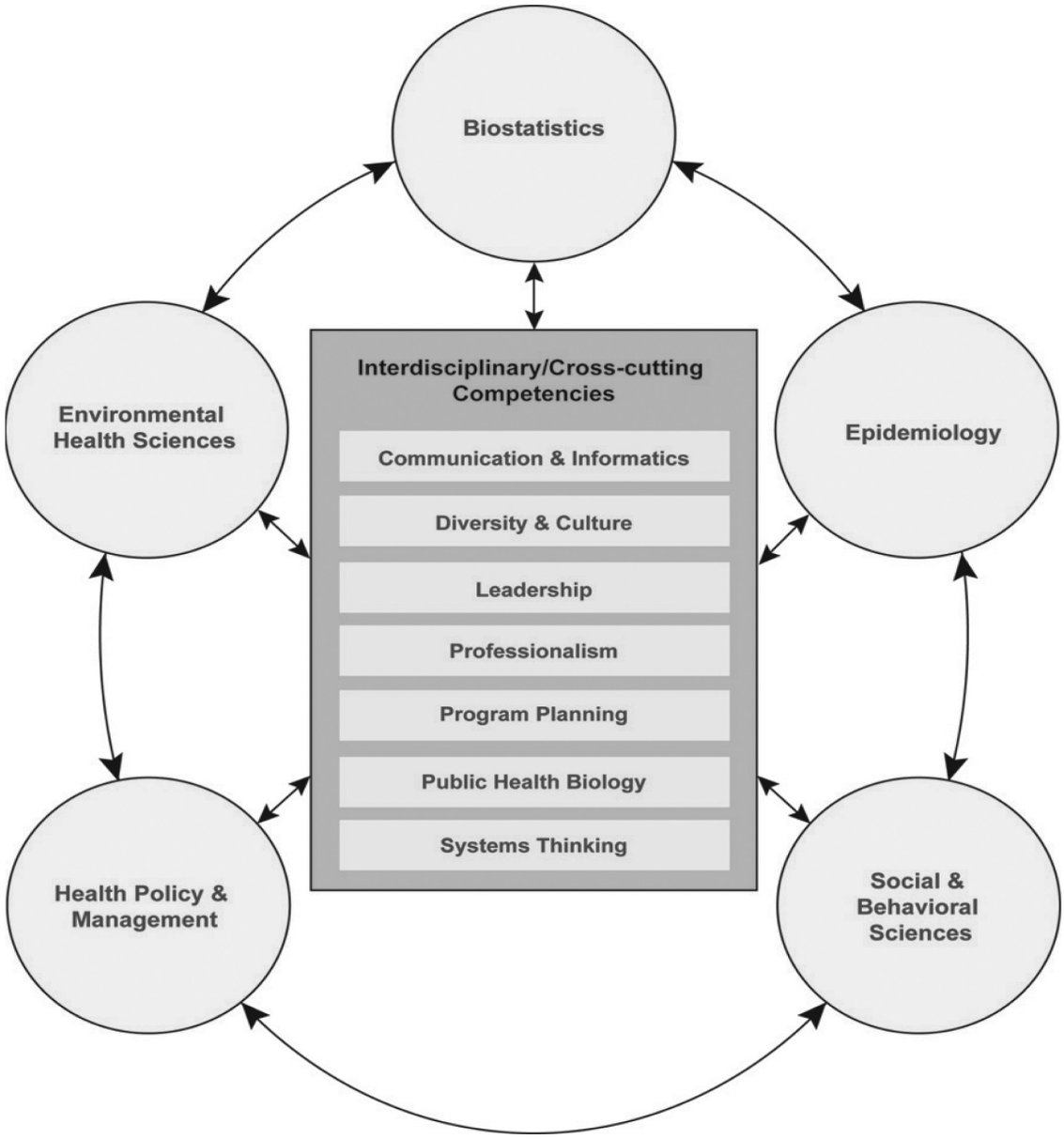

Figure 2. Epidemiology Workgroup

Epidemiology Core Workgroup Members
Dr. Michel Ibrahim, Johns Hopkins Bloomberg School of Public Health
Dr. Michael Moser, Akron Health Department and Northeastern Ohio Universities College of Medicine
Dr. Kristin Anderson, University of Minnesota School of Public Health
Dr. Erin Bell, University at Albany SUNY School of Public Health
Dr. James Gale, University of Washington School of Public Health and Community Medicine
Dr. Dan Herman, Columbia University Mailman School of Public Health
Dr. Paul Muntner, Tulane University School of Public Health and Tropical Medicine
Dr. Arthur Reingold, University of California at Berkeley School of Public Health
Dr. Heather Stockwell, University of South Florida College of Public Health
Epidemiology Resource Group Members
Dr. Anne Aschengrau, Boston University School of Public Health
Dr. Zhao Chen, University of Arizona, Mel and Enid Zuckerman College of Public Health
Dr. E. Francis (Fran) Cook, Harvard School of Public Health
Dr. Roberta McKean-Cowdin, University of Southern California
Dr. Robert Dubrow, Yale University School of Public Health
Ms. Jo Ann Glad, Allegheny County Health Department
Dr. Arden Handler, University of Illinois at Chicago School of Public Health
Dr. Carol Hogue, Emory University Rollins School of Public Health
Ms. Elissa Laitin, Arlington County Public Health Division
Dr. Michael Lebowitz, University of Arizona, Mel and Enid Zuckerman College of Public Health
Dr. Philip Nasca, University of Massachusetts School of Public Health and Health Services
Dr. George Rhoads, University of Medicine and Dentistry of New Jersey School of Public Health
Dr. Russell Rycheck, University of Pittsburgh Graduate School of Public Health
Dr. Victor Schoenbach, University of North Carolina at Chapel Hill School of Public Health
Dr. Evelyn Talbott, University of Pittsburgh Graduate School of Public Health
Dr. John Vena, University of South Carolina Arnold School of Public Health
Dr. Paul Visintainer, New York Medical College School of Public Health

The Epidemiology Workgroup process

While recognizing that it was not developing competencies for practicing epidemiologists and was not empowered to define the entire discipline of epidemiology, the Epidemiology Workgroup did feel that it needed to have a working definition of epidemiology for the purposes of this project. After discussion, the following working definition was accepted: "Epidemiology is the study of patterns of disease and injury in human populations and the application of this study to the control of health problems."

In the belief that others before them had likely considered the question of epidemiology competencies, and wanting to learn from this prior work, the workgroup chairs directed the ASPH staff assigned to the workgroup to identify, review, and summarize all previous compilations of epidemiology competencies. ASPH staff collected this information via Web searches, surveys of the core and expanded resource workgroups, and reviews of CEPH accreditation self-evaluation reports.

Staff also contacted other organizations involved in public health competency development, including the Council on Linkages Between Academia and Public Health Practice, the Northwest Center for Public Health Practice, and the Public Health Prevention Service at the Centers for Disease Control and Prevention (CDC). The results of this search were compiled in a comprehensive listing (the megalist) that contained more than 400 epidemiology-related competency statements. Staff also prepared digests of the search results, which arrayed the epidemiology-related competency statements in categories. A complete list of all epidemiology competency statements considered by the workgroup for this vetting process is available at http://www.asph.org/UserFiles/Master%20Comp.xls. A list of the resources examined by staff to prepare this list is available at http://www.asph.org/document.cfm?page=935.

ASPH staff coordinated workgroup meetings by telephone conference calls at prearranged times using a commercial hosting firm to provide the telecommunications bridge. At its initial meeting, the core workgroup reviewed its charge and agreed on a general process for undertaking the project. Workgroup members began by reviewing the lists of epidemiology

competency statements assembled by staff and submitting any additional competency statements that seemed warranted. All subsequent nominated statements were added to the megalist.

Staff then set up an Internet-based survey tool to refine the megalist. Members used a nominal group technique—modified Delphi process—for this and succeeding selection rounds. Respondents considered each candidate competency and responded in a structured fashion. The options for these responses varied slightly in each of the Delphi rounds and are summarized in Figure 3.

After the first Delphi round, the Epidemiology Workgroup found itself with 24 competency statements that had obtained widespread support and moved into the next stage. Core workgroup members met by conference call to discuss the results of Delphi #1. Each candidate competency was considered individually and efforts were made to clarify ambiguous language. The group was asked to give careful consideration to the possibility of absence from the competency list of any epidemiology competency that might be important for successful public health practice. Clearly redundant statements were combined. A criterion for selection introduced during the second round of discussion and reiterated throughout the remainder of the epidemiology competency selection process was, "Is this competency measurable?"

From these discussions and associated e-mail exchanges, the cochairs developed a refined list of candidates for the second Delphi round. For the second Delphi, both the core workgroup and the expanded resource workgroup were asked to participate. Participation from the Epidemiology Workgroup was high in all Delphi rounds, averaging 91% (Table).

After the second Delphi round, the workgroup reached consensus on a list of 15 epidemiology core competency candidates. The subsequent discussion among members of the core workgroup brought under more intense scrutiny the rationale for required acquisition of epidemiology competencies by *all* MPH graduates. In this context, the core workgroup considered the many occupational settings in which MPH graduates might find employment. The group's consensus was that it is necessary for MPH graduates to possess core epidemiology competencies to prepare them to appropriately and effectively assemble and/or interpret information about health and disease in human populations. Knowledge of information and programs developed using epidemiologic methods and insights was recognized as important in public health practice, but possession of such content knowledge by every MPH graduate was considered secondary in priority to fundamental skills in population data acquisition and interpretation.

The language of each candidate competency was repeatedly examined for clarity. Members discarded competencies for which a feasible mechanism could not be proposed to evaluate student success upon acquisition. Bloom's taxonomy for educational objectives and assessment[8–10] was utilized as a core resource for the entire MPH Core Competency Development project. The Epidemiology Workgroup's cochairs worked with the project consultant to assure that the final epidemiology MPH core competencies were written to be consistent with Bloom's taxonomy.

With the assistance of the project consultant, the workgroup examined the complexity and character of the candidate competencies, striving for a mix of competencies that addressed needs for basic knowledge, higher-level analysis and interpretation, and affective elements. The group did not feel that any of the core competencies for the epidemiology domain involved the development of motor (sometimes referred to as technical) skills.

The third Delphi round conducted among the core

Figure 3. Criteria for acceptance of each competency in the modified Delphi surveys

Pre-Delphi voting (only for SBS workgroup)	*Delphi Round 1*	*Delphi Round 2*	*Delphi Round 3*
1. Yes 2. No 3. Maybe	1. Accept 2. Accept with changes 3. Reject 4. Consider an alternative as noted below 5. If "accept with changes," how should it be reworded?	1. Accept 2. Reject 3. Accept with changes 4. If "accept with changes," how should it be reworded?	1. Accept 2. Reject 3. Final comments (use the box for comments)

NOTE: In all three rounds of each survey, respondents had the opportunity to provide input by using a General Comments section.
SBS = social and behavioral sciences

Table. Epidemiology Workgroup Delphi processes summary

Steps		*Delphi 1*		*Delphi 2*		*Delphi 3*		*Final list*	
Workgroups	*Initial action*	*Number of competencies*	*Response rate (percent)*	*Number of competencies*	*Response rate (percent)*	*Number of competencies*	*Response rate (percent)*	*Discipline-specific competencies*	*Cross-cutting competencies*
Epidemiology	Staff developed megalist containing more than 400 competencies, followed by cochairs' review	24	100	15	92	11	81	10	2

workgroup produced a consensus list of 11 epidemiology core competencies. The cochairs then facilitated a final set of discussions to achieve the prespecified target of 10 epidemiology core competencies. In addition, the workgroup made a strong recommendation that two competencies not included on their final list be considered for inclusion in a cross-cutting competency category.

RECOMMENDATIONS OF THE EPIDEMIOLOGY WORKGROUP

The epidemiology core competencies for all MPH graduates recommended by the Epidemiology Workgroup are listed in Figure 4. In addition, the workgroup strongly recommended to the Education Committee that one or more cross-cutting competency domains be established and that the following cross-cutting competencies be included:

Upon graduation, a student with an MPH should be able to:

1. Interact appropriately and sensitively with people from diverse backgrounds, including but not limited to diversity of culture, age, gender, education, race, ethnicity, lifestyle, profession, and socioeconomic status.
2. Understand the need for lifelong learning to remain a master of public health.

Figure 4. Epidemiology core competencies for all Master of Public Health (MPH) graduates

Upon graduation, a student with an MPH should be able to:

1. Identify key sources of data for epidemiologic purposes.
2. Identify the principles and limitations of public health screening programs.
3. Describe a public health problem in terms of magnitude, people, time, and place.
4. Explain the importance of epidemiology for informing scientific, ethical, economic, and political discussion of health issues.
5. Comprehend basic ethical and legal principles pertaining to the collection, maintenance, use, and dissemination of epidemiologic data.
6. Apply the basic terminology and definitions of epidemiology.
7. Calculate basic epidemiology measures.
8. Communicate epidemiologic information to lay and professional audiences.
9. Draw appropriate inferences from epidemiologic data.
10. Evaluate the strengths and limitations of epidemiologic reports.

EXTERNAL CONSULTATION

During its deliberations, the Epidemiology Workgroup sought to communicate with key academic and practice constituencies. The workgroup cochairs and ASPH staff conferred by telephone with the CDC point of contact for the CDC/Council of State and Territorial Epidemiologists (CSTE) project on Competencies for Applied Epidemiologists in Governmental Public Health Agencies (AECs)[11] to verify that the two projects would not be redundant. Two members of the ASPH Epidemiology Core Competencies Workgroup were also participants in the AECs project. The ASPH epidemiology MPH core competencies were conceived as academic competencies to provide a foundation for future public health practice in any field, while the CDC/CSTE AECs were developed as practice competencies for people working as epidemiologists.

Staff shared information with the CDC/CSTE project during the ASPH workgroup's vetting and selection process, while the candidate lists of competencies were being developed, and as the criteria used for selection of core competencies were selected. Staff circulated the list of core MPH competencies recommended by the Epidemiology Workgroup widely among public

health academics and other stakeholders, with requests for comments. When comments were received, the cochairs reviewed them to determine if they raised issues that had not been addressed during workgroup deliberations. Staff then prepared responses to each questioner. Within ASPH, staff circulated the competency recommendations for review among both faculty and leadership groups prior to adoption by the ASPH Board.

CONCLUSIONS

It is timely and appropriate that academic institutions offering a program of study leading to the MPH degree give consideration to use of a competency model for this professional degree. At this time, whether and to what extent MPH degree granting institutions adopt such a model is the decision of each institution and its faculty. The MPH Core Competencies matrix developed by ASPH outlines a comprehensive set of core competencies for MPH graduates that should be a valuable reference for any institution and faculty choosing to pursue a competency approach to graduate public health education.

The 26 members of the Epidemiology Workgroup were able to bring a broad range of insight from academic and practice settings to the competency selection process. The consensus list of 10 epidemiology core competencies that the workgroup produced is a credit to the collective knowledge and wisdom of the workgroup members. It has been reviewed and endorsed by a wide range of professional organizations and individuals, without significant objection. But it is important to remember that any listing of competencies, whether academic or practice-focused, involves some degree of selection and compromise if the listing is to be of practical value.

The list of epidemiology core competencies proposed by the Epidemiology Workgroup and adopted as part of the ASPH MPH Core Competencies matrix is not a canonical document. It can and should continue to be closely examined and critiqued. As schools of public health and other academic institutions work to incorporate core competencies into MPH curricula, it is probable that issues will emerge that were not apparent during the initial core competency project. This is particularly likely as faculty explore integrated implementation of core competencies, both in traditional domains and the new cross-cutting areas.

The epidemiology core competencies outlined in version 2.3 of the ASPH MPH Core Competencies must not be viewed as static dicta, but rather as a starting point for discussion and academic exploration. A sincere commitment to competency-based education will involve challenges and a lot of work. It has the potential to transform both the content and the form of MPH education. It was the goal of the Epidemiology Workgroup to provide a useful benchmark for institutions and faculties that choose to undertake this challenge.

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