

Curriculum Guide for Undergraduate Public Health Education*
Version 2.0

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This Curriculum Guide draws heavily on The Educated Citizen and Public Health: A Consensus Report on Public Health and Undergraduate Education published by the Council of Colleges of Arts and Sciences. The full report can be found at www.ccas.net.

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Preface

This curriculum guide is designed to assist faculty who are developing undergraduate courses in public health as well as educational administrators and faculty curriculum committees who are designing undergraduate public health curricula. It assumes that the primary purpose of undergraduate public health is to produce an educated citizen, one who has achieved the essential learning outcomes put forth by the Association of American Colleges and Universities (AAC&U) in their Liberal Education and American's Promise (LEAP) initiative.

The Curriculum guide is an outgrowth of the November 2006 Consensus Conference on Undergraduate Public Health Education sponsored by the Association for Prevention Teaching and Research (APTR), the Association of Schools of Public Health (ASPH), and the Council of Colleges of Arts and Sciences (CCAS). The Association of American Colleges and Universities (AAC&U) and the Centers for Disease Control and Prevention (CDC) also participated. The development of the Curriculum Guide is being supported by the CDC through the CDC-APTR Cooperative Agreement.

This version 2.0 of the Curriculum Guide begins with an overview of the rationale and recommendations of the Consensus Conference in Section I. Section II looks at ways to integrate public health education into general education. As indicated in section II the three core courses described in this guide, “Public Health 101”, “Epidemiology 101 and Global Health 101 are one way of achieving this purpose. Other cross-cutting and innovative methods to achieve this purpose are also encouraged.

Section III on Experiential Learning- Service Learning in Health is included because of the importance of introducing students to public health through real world experiences with diverse communities, experiences that contribute to what the LEAP initiative calls personal and social responsibility.

Section IV Innovative Teaching Methods highlights the teaching of public health, integrating literature and the arts with social science and science approaches. This section provides an array of multidisciplinary methods that may be used to teach public health from an ecological or big picture approach. These methods may be used as part of the core courses or as the central component of a course designed to link public health with the humanities.

Section V looks at the development of an “epidemiology laboratory” which provides interactive methods for teaching epidemiology designed for classroom use or for an epidemiology laboratory which may be needed to allow epidemiology to fulfill a science distribution requirement.

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In Section VI on Minor and other “Coherent Curriculum” addresses a variety of methods for developing curriculum that goes beyond general education and becomes a coherent component of liberal education.

Section VII provides materials on student assessment while Section VIII addresses administrative issues encouraging faculty and educational administrators to think through these issues as part of the planning process for the development of public health curricula. In Section VIII faculty are referred to web-based resources that may assist them in implementing curricula. Faculty are encouraged to contribute to these resources and to participate in the developing network of faculty throughout the United States who are teaching undergraduate public health as part of general and liberal education.

An Appendix provides additional background information that may be useful to those focused on developing specific curricula. Appendix A describes the use of enduring understandings as the basis for “backward design” of curricula. Appendix B provides detailed advice on using the key concepts of epidemiology as the basis for evidence-based thinking in public health, medicine and health care, as well as a range of social science disciplines including public policy applications. Finally Appendix C provide the ASPH Task Force Statement of the Recommended Content for an Introductory Public Health Course which preceded and helped inform the Consensus Conference on Undergraduate Public Health Education

This is version 2.0 of the curriculum guide. It is designed as a draft for review and feedback. PDF versions of the guide and feedback forms are available on the following web sites:

Association of American Colleges and Universities: www.aacu.org
Association for Prevention Teaching and Research: www.teachpublichealth.org
Council of Colleges of Arts and Sciences: www.ccas.net

Version 2.0 and will again undergo review and feedback. Version 3.0 will be completed by July 2008 and will be widely distributed electronically and in hard copy

Part I. Introduction

Overview: Rationale and Recommendations

In 2003, the Institute of Medicine (IOM) of the National Academies concluded that keeping the public healthy required not only a well educated public health workforce but also an educated citizenry. Therefore, it recommended that “all undergraduates should have access to education in public health” (1). In November 2006 the Consensus Conference on Undergraduate Public Health Education developed a set of recommendations designed to operationalize this recommendation. The full report of the Consensus Conference is available at www.ccas.net under publications.

The participants in the Consensus Conference agreed on the following basic principles:

- The rationale for integrating undergraduate public health into general and liberal education is the development of an educated citizenry
- Introductory public health courses should be designed to fulfill essential learning outcomes included in the Liberal Education and America’s Promise (LEAP) framework developed by AAC&U.
- Introductory public health courses should be designed to fulfill general education distribution requirements
- Minors in public health or global health should build upon introductory/core curricula.

The development of an educated citizenry is a shared goal of arts and sciences and public health. An educated citizen should appreciate the importance of public health challenges ranging from acquired immunodeficiency syndrome to aging, avian influenza, and health-care costs. An educated citizen should be prepared to understand emerging public health issues, analyze options for addressing these issues, and provide the necessary political and financial support needed to address these issues.

The essential learning outcomes that have emerged from the Association of American Colleges and Universities Liberal Learning and America’s Promise (LEAP) initiative are summarized in Box 1. Achievement of many of these learning outcomes can be initiated through the core curriculum outlined in this curriculum guide as well as experiential learning activities, such as service-learning, described in this guide.

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Box 1 The LEAP Essential Learning Outcomes

- **Knowledge of Human Cultures and the Physical and Natural World**
Through study in the sciences and mathematics, social sciences, humanities, histories, language and the arts
Focused on engagement with big questions, both contemporary and enduring
- **Intellectual and Practical Skills**
Inquiry and analysis
Critical and creative thinking
Written and oral communication
Quantitative literacy
Information literacy
Teamwork and problem solving
Practiced extensively, across the curriculum, in the context of progressively more challenging problems, projects, and standards of performance
- **Personal and Social Responsibility, including:**
Civic knowledge and engagement- local and global
Intercultural knowledge and competence
Ethical reasoning and action
Foundations and skills for lifelong learning
Anchored through active involvement with diverse communities and real-world challenges
- **Integrative Learning, including:**
Synthesis and advanced accomplishment across general and specialized studies
Demonstrated through the application of knowledge, skills, and responsibilities to new settings and complex problems

Association of American Colleges and Universities, College Learning for the New Global Century, Washington D.C. 2007 page 3

Public health can be integrated into general and liberal education using a number of strategies. This includes development of cross-cutting courses focused on a particular issue, such as HIV-AIDS or tobacco control, that draws on multiple disciplines. An integrative multidisciplinary curriculum drawing on elements of the sciences, social sciences, and humanities may also be used.

The approach outlined in this curriculum guide focuses on the development of three core courses each of which is designed to fulfill general education requirements. All three of the following courses could be taken as part of general education and could form the core curriculum for a minor in public health. The three courses that are outlined in detail in this curriculum guide are:

Public Health 101- an introductory overview course designed to fulfill a social science distribution requirement.

Epidemiology 101- an introductory course illustrating the scientific method and designed to fulfill a science distribution requirement including the option for an “epidemiology laboratory”.

Global Health 101- an introductory course focused on applying public health principles in developing as well as developed countries designed to fulfill a global studies distribution requirement.

In implementing public health curricula public health practitioners as well as faculty from clinical disciplines which apply public health principles such as nursing should participate in order to expose students to the world of public health practice.

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Contributions of Arts and Sciences to Public Health and Public Health to Arts and Sciences

Before examining the specifics of the recommended core courses, it may be useful to examine the connections between arts and sciences and public health. For decades arts and sciences disciplines have provided underlying intellectual frameworks that have been utilized by public health. At times these frameworks have been so basic to the public health way of thinking that their origins in arts and sciences have gone unrecognized.

Likewise, public health has a great deal to contribute to arts and sciences education, which has only recently begun to be recognized. This section attempts to make explicit the contributions of arts and sciences to public health and visa versa. It is hoped that these recognitions will not only lay the groundwork for educational interactions but will provide the basis for future scholarship that leads to a cross-fertilization of ideas.

Box 2 outlines examples of the multiple contributions of Arts and Sciences disciplines to public health.

Box 2 Examples of Contributions of Arts and Sciences to Public Health Education

Field	Examples of Disciplinary Contributions
History	Frameworks for understanding human health and the impact of social, political, cultural and scientific developments from a global perspective
Philosophy and Ethics	Frameworks for ethical thinking and philosophical understanding of public health and public health's mission including addressing conflicts between the individual and society, social justice and equity
English- literature	Approaches to literature as creative expression of human experience related to health. Development of essential writing skills. Narrative study related to epidemiology.
Psychology	Theories of the origins of behavior and risk taking tendencies and methods for altering individual and social behaviors
Sociology	Theories of social development, organizational behavior and systems thinking. Social impacts on individual and group behaviors
Anthropology	Social-cultural influences on individual and population decision making for health with a global perspective
Political Science/ Public Policy	Approaches to government and policy making related to public health. Structures for policy analysis and the impact of politics and government on public health decision making
Economics	Understanding the micro and macro-economic impact on public health and health care systems
Biology	Understanding of normal biological function, protective mechanisms, and biological alterations by disease as well as biological interventions
Chemistry/ Physics	Mechanism for exposure assessment and understanding the actions of toxic substances as well as normal biochemical functions
Mathematics/ Statistics	Biostatistics methods and the design of health studies
Languages	Communications and cultural understanding as essential for delivery of public health and health care services
Communication	Theory and practice of mass and personalized communication and the media for communicating health information and health risks
Demography	Understanding demographic changes in populations globally due to aging, migration, and differences in birth rates plus their impact on health and society
Geography	Understanding of the impacts of geography on disease and determinants of disease as well as methods for displaying and tracking the location of disease occurrence
Fine Arts	Expressions of public health in theatre, film, music, and visual arts

Note there are additional contributions from interdisciplinary field such as international affairs, environmental sciences, women and gender studies, computer sciences etc.

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Contributions of Public Health to General and Liberal Education

The teaching of public health as part of general and liberal education bring to arts and sciences a number of important components that help fulfill the LEAP essential learning outcomes designed to develop an educated citizen. These include but are not limited to:

- **Population and Global Perspective-** Public health is inherently oriented toward groups of people whether it is addressing a local community problem, a state issue, or a nation-wide or a global problem. Public health issues often transcend traditional boundaries and are rapidly changing in response to such forces as technological change and globalization. Public health serves as an excellent example of the need for educated citizens who can respond to new problems and new opportunities
- **Interdisciplinary, systems thinking, ecological orientation-** big picture thinking whether it is called interdisciplinary, systems thinking or an ecological orientation is an inherent part of public health and a key framework for an educated citizen. Approaches to addressing public health problems require teamwork by a wide range of professionals from diverse backgrounds and disciplines. Public health is an excellent example of the need for and benefits of teamwork in problem solving.
- **Community orientation and community connections-** public health's focus on understanding and serving communities, not just individuals, bring an important contribution to undergraduate education. Public health provides an approach to developing individual responsibility through active involvement with diverse communities and real world challenges as recommended by the LEAP essential learning outcomes.
- **Generic preprofessional education without narrow professional focus-** Undergraduate public health, as presented in this guide, provides an introduction to a wide array of health professions without narrowly focusing on professional education. Understanding of the underlying determinants of disease, the delivery systems for public health and health care systems, and the larger understandings of how demographics and social transitions affect health and disease is excellent preparation for a range of graduate degrees including health professions, law, international affairs, and many others.
- **Teaches methods for life-long learning-** Education in public health, as presented in this curriculum guide, aims to provide an understanding of ways of thinking and ways of acting based on evidence. Evidence-based methods provide a strong basis for life-long learning by providing graduates with the tools to read the research, frame and reframe the issues, and analytically examine the options for intervention.

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Thus arts and sciences contributes a great deal to public health education and the approaches being developed for undergraduate public health education have the potential to help fulfill essential learning outcomes of general and liberal education.

1. Gebbie K, Rosenstock L, Hernandez LM. Who will keep the public healthy? Educating public health professionals for the 21st century. Washington DC: National Academy Press; 2003: 144.

Part II. Core Courses

Principles for Design of Core Courses

Three core public health courses are encouraged for all colleges and universities. When applicable, these courses should be designed to satisfy each institution's distribution requirements as part of general education. These core courses will be referred to as:

- Public Health 101
- Epidemiology 101
- Global Health 101

These three courses are intended to be organized so that a student can take all three courses. Each course may be designed to be taken without prerequisites. There is a modest degree of intended overlap. This will require careful coordination in the design of the courses. For instance basic principles of epidemiology are included in Public Health 101 and repeated in Epidemiology 101 as well as Global Health 101. This is consistent with a need to appreciate these concepts as central to an evidence-based public health or population health approach which should underlie all three courses.

This evidence-based approach to public health increasingly referred to as population health has four components:

- Problem- identify the problem
- Cause- identify risk factors or if possible contributory causes
- Intervention- consider evidence-based recommendations for potential interventions to control or eliminate the problem
- Implementation- develop a strategy for putting one or more interventions into practice

All three core courses are designed to prepare students for the LEAP goal of life-long learning. As such the courses should teach students how to frame questions, analyze underlying causes, brainstorm solutions, and critically analyze the methods for implementation. Teaching using an evidence-based public health or population health approach can help achieve all of these objectives. An extended example of the population health approach with links to an array of Internet resources is available at www.teachpublichealth.org/resources.

These three courses should each be designed to fulfill distribution requirements. For instance, if a college or university requires a social science, science, and global distribution requirement, these may be satisfied by Public Health 101, Epidemiology 101, and Global Health 101 respectively.

For institutions whose distribution requirements are cross-disciplinary, there are a large number of excellent opportunities to utilize cross-cutting public health examples. For instance HIV-AIDS might be a topic for a cross-cutting course involving biology, psychology, anthropology, political science, sociology etc. Tobacco control might engage history, statistics, and visual arts as well as many of the above disciplines. There are

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many more examples from Avian flu, to traditional healing, to the impacts of modern technology. In addition see the section on Innovative Teaching Methods for an approach that may be used to integrate the social science and sciences aspects of public health with the humanities.

These courses are intended as undergraduate courses not as substitutes for graduate courses, though they may enable students to enter more rigorous graduate level courses. They are designed to be part of general education and to fulfill LEAP learning outcomes.

The Consensus Conference outlined a series of specific recommendations for Epidemiology 101 that highlight the uniquely undergraduate focus that is intended. Epidemiology 101 should be designed to encourage students to see epidemiology as a way of thinking and a way of learning generalizable principles of the scientific method. To achieve these aims the Consensus Conference indicated the following:

- Epidemiology 101 should be conceptual rather than technical so that the underlying methods are apparent to a broad range of students. For example, it might employ stratification rather than regression methods to illustrate adjustment for confounding, because the emphasis is on active engagement and ensuring an intuitive and clear understanding of key principles.
- Epidemiology 101 should stress learning outcomes that are part of the broader LEAP goals of general education, including ethical reasoning such as the ethical expectations of randomized clinical trials, teamwork for problem solving, integration of learning, and skills for lifelong learning. These goals are compatible with and additional to the LEAP outcomes of understanding scientific methods, critical thinking, and quantitative and information literacy.
- Epidemiology 101 should use examples not limited to traditional health and medicine in order to address the LEAP learning outcomes. Cause and effect might be illustrated by examples from biology or economics. Quantitative decision may use examples ranging from forensics to environmental monitoring. The specific examples are less important than the emphasis on illustrations reinforcing the broad applicability of epidemiology from basic science to public policy.

Enduring Understandings, Curriculum Frameworks, Learning Outcomes

The following materials are serving as the basis for the Undergraduate Public Health Education Faculty Development Program sponsored by APTR and AAC&U. The materials on Public Health 101 and Epidemiology 101 presented here originated largely from the Consensus Conference on Undergraduate Public Health Education. Global Health 101 has been added based on the clear interest of colleges and universities that have participated in the faculty development program. Additional modifications are expected based on the feedback received on this version 1.0 of the curriculum guide.

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The following materials are provided to assist faculty in developing each of the core courses.

- **Enduring Understandings-** These are key principles that should become a part of the long term understanding of all those who complete the course. Each section contains 10 key principles that will hopefully remain part of the thinking of graduate 10 years after graduation and long after that. Enduring understandings should be the starting point for “backwards design” of curriculum. The Appendix includes a discussion of enduring understandings and their use in curriculum design. Those unfamiliar with enduring understandings are strongly encouraged to review this material.
- **Curriculum Framework with Commentary-** Outlines with explanations providing structures for core courses. These may serve as the basis for development of syllabi.
- **Learning Outcomes-** Outcomes of courses that can serve as the basis for student assessment, coordination of curriculum, and evaluation of courses. Learning outcomes were designed using Bloom’s Taxonomy. Basic and advanced learning outcomes are provided for Public Health 101 and Epidemiology 101 and Global Health 101.

Drafts of these three materials for each of the three core courses follow.

Public Health 101

Enduring Understandings:

1. The history, philosophy and literature of public health reflects broader social influences and movements that affect how we view current health issues that affect everyone's everyday life.
2. Population health represents a population perspective on health as well as evidence-based methods used by health professionals and institutions to define and address our common concerns as a society as well as the needs of vulnerable groups within our society.
3. The population health approach includes efforts to define the problem, establish the cause, develop evidence-based recommendations for interventions, and make decisions about strategies for implementation. Epidemiology serves as the basic science of public health by providing evidence for defining the public health problem, assessing causation, and evaluating effectiveness of potential interventions
4. Options for intervention can be analyzed using a framework including *when* (primary, secondary, and tertiary), *who* (individual, at-risk group, general population) and *how* (education, motivation, obligation) to intervene.
5. Laws and regulations are widely used tools for implementing health policies which require careful analysis and development to successfully achieve their intended purpose(s).
6. Public health communications and informatics can be effective tools for influencing health behavior, communicating information on risk and communicating evidence-based public health recommendations.
7. Methods for changing health behavior require the complementary approaches of public health and clinical care and health communications
8. Understanding health care and public health systems domestically and globally requires appreciation of the roles of health professionals; the roles and regulation of service delivery institutions; the financing mechanism and incentive systems for the funding of services; and the quality, access to and costs of health services.
9. Chronic mental and physical disease and impairments increasingly represent the predominant impacts on mortality and morbidity reflecting the epidemiological and demographic transitions that have occurred as countries experience social and economic development Screening for early detection of disease and social as well as medical management of chronic diseases is needed to respond to this changing pattern of morbidity and mortality.
10. Communicable disease, environmental health and prevention and management of disasters are central to the health of populations and public health methods are key to their elimination or prevention, control, and minimizing their adverse impacts.

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Public Health 101- Curriculum Framework with Commentary

I. Overview and Basic Principles

- Context and scope of public health, including history, philosophy, literature, essential services, ethics, and applications to current events — Public health placed in historical and modern perspective.
- Public health as cross-cutting and systematic — Interdisciplinary concepts introduced early and integrated throughout the course (e.g., examining the options for interventions to address public health concerns).
- Epidemiologic principles and population perspective — Rates, risk factors, and health status indicators of morbidity and mortality; disease determinants, causation, and types of epidemiologic research; and public health surveillance and vital statistics.

II. Population Health Tools

- Health communication and informatics — Accessing and evaluating the quality of health information and data in the mass media, including the Internet.
- Health and social and behavioral sciences — Impact on health and methods for altering behaviors at the individual and population levels.
- Health policy, law, and ethics — Tools for implementing health decisions and potential tensions between individual rights and social responsibilities.

III. Morbidity and Mortality: Determinants, Burdens, and Interventions

- Environmental and occupational health and safety — Impact and control on health status.
- Communicable diseases — Prevention, detection, and control from a population perspective.
- Noncommunicable diseases, unintentional injuries, and violence — Effects on longevity and quality of life and methods to prevent, detect, cure, and minimize. Concepts of society's epidemiological and demographic transitions

IV. Health-Care and Public Health Systems

- Health workforce — Professionals' roles and options within the health care and public health workforce.
- Organization of health care and public health systems — Institutions and structures of health care and public health systems, both national and international; the distinct roles and complementary responsibilities of health care and public health systems; and the mechanisms, including insurance systems, for paying for health services.
- Costs, quality, and access to health-care and public health services — Reasons for health-care costs, criteria for quality, and effects of inadequate access.

V. Special Public Health Education Focus Areas

- Health disparities and vulnerable populations — Overview of public health's commitment to vulnerable populations, including maternal and child care, aging, persons with disabilities, and socioeconomic ally disadvantaged populations.

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- Public health preparedness and disaster management — Essential roles of public health in preparedness for and response to natural or terrorism-related disasters.

Public Health 101- Learning Outcomes

Basic Learning Outcomes

1. Identify eras in the historical development of public health and ways that public health affects literature and the arts, current events, and everyone's daily life
2. Illustrate the interdisciplinary, cross-cutting or ecological character of public health and the contributions of a range of disciplines and professions to improving health
3. Explain the basic principles of epidemiology, including rates, risk factors, disease determinants, causation and public health surveillance ;
4. Explain how public health assesses the options for intervention to improve the health of a population
5. Explain how public health can utilize health information and health communications to improve the health of populations
6. Explain how public health can utilize social and behavioral interventions to improve the health of populations
7. Explain how public health can utilize health policy and law to improve the health of populations
8. Explain the impact of the environment and communicable diseases on the health of populations
9. Explain the burden of chronic diseases on morbidity and mortality and approaches to prevention and early detection
10. Describe the basic organization of health care and public health systems and the contributions of health professionals
11. Identify the basic payment mechanisms for providing health services and the basic insurance mechanisms for paying for health services
12. Identify criteria for evaluating health systems including issues of access, quality, and cost.
13. Identify the roles of public health in addressing the needs of vulnerable populations and health disparities
14. Identify the roles of public health in disaster prevention and management

Advanced Learning Outcomes

1. Apply the public health approach- problem, cause, intervention and implementation to a new public health problem
2. Apply principles of health communications and informatics to evaluation the quality of health information on the Internet or in the mass media
3. Analyze the advantages and disadvantages of a potential intervention
4. Apply principles for evaluating the quality of a health delivery system to that of a new health delivery system
5. Analyze the determinants of morbidity and mortality in a new situation
6. Analyze the degree of success in implementing essential public health services in a new situation

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7. Synthesize the principles and tools of public health as applied to a new public health problem

Enduring Understandings- Epidemiology 101

1. The causes of health and disease are discoverable by systematically and rigorously identifying their patterns in populations, formulating causal hypotheses, and testing those hypotheses by making group comparisons. These methods lie at the core of the science of epidemiology. Epidemiology is the basic science of public health, a discipline responsible for improving health and preventing disease in populations.
2. Health and disease are not distributed randomly. There are patterns to their occurrence. These patterns can be identified through public health surveillance looking for patterns based on person, place and time. Analysis of these patterns can help formulate hypotheses about the possible causes of health and disease.
3. A hypothesis can be tested by comparing the frequency of disease in selected groups of people with and without an exposure to determine if the exposure and the disease are associated.
4. One possible explanation for finding an association is that the exposure causes the outcome. Because studies are complicated by factors not controlled by the observer, other explanations also must be considered, including chance and bias.
5. When an exposure is hypothesized to have a beneficial effect, studies known as randomized clinical trials may at times be designed in which a group of people is randomly assigned to be intentionally exposed to the hypothesized cause and compared to a group that is not randomly assigned to be exposed.
6. When an exposure is hypothesized to have a detrimental effect, it is not ethical to intentionally expose a group of people. In these circumstances, studies can be designed that observe groups of free-living people with and without the exposure.
7. Judgments about whether an exposure causes a disease are developed by examining a body of epidemiologic evidence as well as evidence from other scientific disciplines. While a given exposure may be necessary to cause an outcome, the presence of a single factor is seldom sufficient. Most outcomes are caused by a combination of exposures that may include genetic make-up, behaviors, social, economic, and cultural factors, availability of healthcare and the environment.
8. Individual and societal health-related decisions about interventions to improve health and prevent disease are based on more than scientific evidence. Social, economic, ethical, environmental, cultural, and political factors may also be considered in implementation decisions. The effectiveness of a health-related strategy can be evaluated by comparing the frequency of the outcome in carefully selected groups of people who were and were not exposed to the strategy. Costs, trade-offs of harms and benefits, and alternative solutions must also be considered in evaluating the strategy.
9. Principles of testing and screening based on Bayes theorem lie at the core of disease diagnosis and screening for disease and have applications to a range of social decision making in security, forensics, quality control efforts etc.

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10. An understanding of non-health related phenomena can be also be developed through epidemiologic thinking, by identifying their patterns in populations, formulating causal hypotheses, and testing those hypotheses by making group comparisons.

Epidemiology 101 curriculum framework

I. History, Philosophy, and Uses of Epidemiology

- Historical contributions and modern uses of epidemiology — Development of epidemiologic thinking and placement of epidemiology in historical and modern perspective.
- Ethics and philosophy of epidemiology — Appreciation of the links between epidemiology and broader ethical and philosophic traditions and concerns.

II. Descriptive Epidemiology

- Condition, frequency, and severity — The basic tools of epidemiologic analysis, including case definitions and populations, incidence, prevalence, and case-fatality rates.
- Data regarding disease or injuries — Vital statistics, public health surveillance, and measures of health status, including methods for describing quantitatively the natural history, frequency, and changes in infectious and chronic diseases and injuries.
- Patterns of disease and injuries — Application of the basic tools of epidemiology to generate hypotheses regarding person, place, and time; changes and differences in rates; exposures; incubation periods; and disease spread.

III. Association and Causation

- Estimation — Measures of strengths of association, graphical display of data, risk, relative risk/risk ratios, and attributable risk.
- Inference — Concepts of statistical significance and confidence intervals
- Bias, confounding, and adjustment — Identification of bias, confounding, and effect modification/interaction and methods to prevent and take into account their impact.
- Causation — Risk factors and other determinants of diseases and conditions.

IV. Analytic Epidemiology

- Basic epidemiologic study designs and their application to population health including: ecologic or population comparison, cross-sectional, case-control, and retrospective and prospective cohort.
- Experimental studies — Randomized clinical trials and community trials and their applications to the efficacy and effectiveness of disease or injury etiology and the efficacy and effectiveness of interventions

V. Evidence-Based Public Health and Evidence-Based Recommendations

- Harm, benefit, and cost analyses — Evidence-based decision analysis regarding risks, benefits, and cost-effectiveness of interventions.

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- Intervention efficacy and effectiveness — Evidence-based analyses of interventions' capacity for producing desired results and measurement of the accuracy or success of prevention and control efforts for diseases or injuries.

VI. Applications to Policy and Basic and Clinical Sciences

- Outbreak investigation, testing, and screening — Application of epidemiologic methods and basic and clinical science.
- Public health policy — Application of results from investigations and analyses to influence policymaking.
- Special epidemiologic applications — Molecular and genetic epidemiology, environmental and occupational health and safety, unintentional injury and violence prevention, and behavioral sciences.

Basic Learning Outcomes

1. Describe the historical roots of epidemiologic thinking and their contribution to the evolution of the scientific method.
2. Explain how ethical principles affect epidemiologic research
3. Use rates and proportions to express numerically the amount and distribution of health- and nonhealth-related outcomes.
4. Use the distribution of a health-related outcome to generate hypotheses that might provide an explanation.
5. Explain basic statistical and epidemiologic concepts of estimation, inference, and adjustment to establish association.
6. Explain how to use evidence of an association to make a judgment about whether an association is causal.
7. Describe the basic epidemiologic study designs that are used to test hypotheses, identify associations, and establish causation.
8. Describe the concepts of measurement of test performance and be able to apply the concepts of testing and screening in different settings.
9. Apply the concepts benefits, harms, and cost to a public health decision.
10. Describe the broad applicability of epidemiologic methods to clinical and basic science as well as public policy.

Advanced Learning Outcomes

1. Analyze the evidence for and against a recommendation for intervention.
2. Analyze a public health problem (e.g., investigation of a disease outbreak) using epidemiologic methods.
3. Synthesize epidemiological methods to assess the strengths and weaknesses of assertions in the scientific literature and popular press.
4. Evaluate the design of an epidemiologic investigation demonstrating the ability to reconcile scientific validity and ethical sensitivity.

Enduring Understandings Global Health 101

1. There are strong links between health and economic and social development. This health and development link is especially important in economically developing societies but also apply to developed countries
2. Health status is determined by a variety of factors, including income, education, knowledge and practice of healthy behaviors, socio-economic status, biology, gender and access to health services. When measuring comparing health status within and between societies, it is important that morbidity be considered, along with mortality.
3. There has been enormous progress in improving health status over the last 50 years in many countries. This is reflected in the substantial increases in life-expectancy. Some of this progress has come about as a result of overall economic development and improvements in income. However, much of it is due to improvements in water supply and sanitation, and better education. Increased nutritional status has also had a large impact on improvements in health status. Technical progress in some areas, such as the development of vaccines against childhood diseases and the development of antibiotics, has also improved human health.
4. The progress in health status, however, has been very uneven. Hundreds of millions of people, especially poorer people in low- and middle-income countries, continue to get sick, be disabled by, or die from preventable causes of disease. In many countries, nutritional status and health status of lower-income people have improved only slowly. In addition, HIV/AIDS is causing a decline in health and nutritional status and life expectancy in a number of countries in Sub-Saharan Africa.
5. There are enormous disparities in health status and access to health services both within and across countries. Wealthier people in most countries have better health status and better access to health service than poorer people. In general, urban dwellers and ethnic majorities enjoy better health status than rural people and disadvantaged ethnic minorities. In addition, women face a number of unique challenges to their health.
6. As countries develop economically they go through two important transitions. The first is the demographic transition, a shift from high fertility and high mortality to low fertility and low mortality. The second is a shift from a pattern of disease that is predominantly characterized by communicable diseases to one that is characterized predominantly by non-communicable diseases. It increasingly appears that countries also go through a nutrition transition, from unprocessed and locally prepared foods, relatively low in sugar, salt, and fats to manufactured and processed foods, relatively high in sugar, salt, and fats.
7. Countries do not need to be high-income to enjoy good health status. There are a number of examples that make clear that low-income countries or low-income areas within countries can help their people to achieve good health, even in the absence of extensive financial resources to invest in health. However, this requires strong political will and a focus on sanitation, education, and investing in low-cost but high yielding investments in nutrition and health.

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8. Many of the most important contributors to the burden of disease can be addressed through interventions that are cost-effective. Many of these are low cost as well, such as control of TB or early diagnosis and treatment of malaria.
9. Some global health issues can only be solved through the cooperation of various actors in global health. This could include, for example, control of pandemic influenza, climate change, and eradication of specific diseases.
10. An important part of health status is determined by an individual's and families' own knowledge of prevention including principles of sanitation, health behavior, and nutrition. Individuals and communities have tremendous abilities to enhance their own health status through community-based efforts.

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Global Health 101 Curriculum Framework with Commentary

I. Basic Principles of Global Health

Basic frameworks for understanding global health issues and the improvement of health at a population level

1. Measuring Health

Measures of health status such as mortality of children under 5, life-expectancy, and health adjusted life expectancy (HALEs)

2. Determinants of Health

Demographic and epidemiological transitions as well as the biological, behavioral, environmental, geographical, medical and socio-economic determinants of health

3. Health and Socio-Economic Development

The health and development link, equity and social justice, and the principles of cost-effectiveness analysis in health.

II. Health and Society

Cross-cutting issues underlying the strategies and organization for delivery of health care and population health services

1. Human Rights, Ethics and Global Health

Basic principles of human rights and research ethics, and ethical decision making, related to global health

2. Healthcare and Public Health Systems

The organization and functions of health systems in developing and developed countries including connections between healthcare and public health, comparative health care systems, and critical health system challenges.

3. Culture and Health

Cultural factors influencing the structure and function of healthcare and public health systems as well as individual health behaviors, choices of interventions, and utilization of services

III. The Burden of Morbidity and Mortality

Approaches to reducing morbidity and mortality including measuring the burden of diseases and other conditions; identification of risk factors; and evidence-based identification of cost-effective interventions to reduce morbidity and mortality.

Understanding of the biological principles relevant to key conditions included in each of the areas below is essential.

1. Environment
2. Nutrition
3. Gender and Health
4. Child Health
5. Communicable Diseases
6. Non-Communicable Diseases

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7. Unintentional and Intentional Injuries

IV. Global Cooperation for Health

Approaches to global cooperation to address health issues that cross national borders and/or require consistent multinational approaches for successful intervention

1. Disasters and Complex Humanitarian Emergencies

Issues of preparedness, emergency response, and post-disaster management

2. Science and Technological Innovation for Global Health

Global structures and incentives for encouraging innovative approaches to health problems and dissemination of innovation

3. Global Institutions and Global Cooperation

Current and potential structures for collaboration for improving health, including multi-national, bilateral, non-governmental organizations (NGOs), foundations, and public-private partnerships

Global Health 101 – Learning Outcomes

Basic Learning Outcomes

1. Describe key public health concepts related to global health including: the demographic and epidemiological transitions, measures of health status, and the burden of disease
2. Describe how globalization has changed the patterns of spread of disease and the methods needed to control disease
3. Discuss the multi-directional links between health and social and economic factors
4. Discuss how social and cultural factors can affect a society's vulnerability to morbidity and mortality and its approaches to prevention and control.
5. Identify health conditions that have a major impact on morbidity and mortality and key concepts in biological concepts needed to understand their public health importance
6. Identify critical issues in the organization and delivery of public health and health care services to address these conditions
7. Discuss the determinants of health and risk factors for conditions of major importance to global health
8. Discuss the burden of disease in various regions of the world and the variations in incidence and prevalence both within and across countries
9. Discuss the potential for science and technology to contribute to the improvement in health
10. Identify key organizations and institutions and their roles in global health and the manner in which they can cooperate to address key global health issues
11. Apply principles of cost-effectiveness, benefits and harms, and sustainability of a new intervention designed to improve global health.
12. Apply understandings of the impact of culture on health to addressing issues of cultural diversity

Advanced Learning Outcomes

1. Analyze the epidemiological features of a disease that provide opportunities for successful interventions or present barriers to success
2. Analyze the biological features of a disease that provide opportunities for successful interventions or present barriers to success
3. Analyze the socioeconomic features of a disease that provide opportunities for successful interventions or present barrier to success
4. Synthesize the options for intervention for a global health problem and develop a strategy for implementation.

Part III. Experiential Learning: Service-Learning in Health

By Suzanne Cashman Sc.D.

Experiential Learning

Experiential Learning, an approach to learning that includes service-learning, is a term used to describe learning undertaken by students who are given a chance to acquire and apply knowledge, skills and feelings in an immediate and relevant setting. It links theory and practice, and involves a “direct encounter with the phenomena being studied rather than merely thinking about the encounter, or only considering the possibility of doing something about it” (Borzak, 1981). It is, in short, education that “occurs as a direct participation in the events of life.” (Houle, 1980).

Experiential education as a philosophy can be linked directly to three historical figures: , John Dewey, Kurt Hahn and Paulo Freire. All three viewed student experiences as playing a central role in the educational process. For each of these educators, the ultimate aim of education was active citizenship, i.e., the development and enhancement of one’s capacity to participate in democracy.

Experiential education differs from more traditional education through the process of actively engaging students in experiences that have benefits and consequences. Teachers help immerse students in action and then ask them to reflect on the experience. Students make discoveries and experiment with knowledge themselves instead of hearing or reading about others’ experiences. They also reflect on these experiences, thus developing new skills, new attitudes, and new theories or ways of thinking (Kraft & Sakofs, 1988). Students are encouraged to relate their experiences to existing knowledge and theory, thus deepening their understanding of theory as it exists or contributing to modifications in theory.

Service-Learning Introduction and Background

Service-learning is a type of experiential learning that has a long and substantial history. A few highpoints are listed below. Additional information regarding its origins and history can be obtained from references, including web sites listed at the end of this section.

- The origins of service-learning are directly traceable to the early 20th century’s University of Cincinnati’s Cooperative Education Movement as well as William James and John Dewey’s pedagogical writings
- While many of the early entries in the service-learning catalogue feature an emphasis on service, current definitions of and approaches to service-learning stress the bridge that ensures service and learning co-occur.

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While multiple definitions of service-learning exist, the one promulgated by many leading organizations defines service-learning as:

“...a structured learning experience that combines community service with preparation and reflection. Students engaged in service-learning provide community service in response to community-identified concerns and learn about the context in which service is provided, the connection between their service and their academic coursework, and their roles as citizens” (Seifer, 1998).

Service-learning as a pedagogical methodology promotes learning through a cycle of action and reflection. Students apply what they are learning in the classroom to community problems and at the same time, reflect upon their experiences as they strive to achieve specific objectives with and for the community as well as deeper understanding and skills for themselves. In service-learning, the intent is often that the activity change both the recipient and the provider of the service. This is accomplished by combining service tasks with structured opportunities that link the task to self-reflection, self-discovery, and the acquisition and comprehension of values, skills, and knowledge. According to the National Commission on Service-Learning, service-learning is different from volunteerism in that it is "a teaching and learning approach that integrates community service with academic study to enrich learning, teach civic responsibility, and strengthen communities."

Achieving a balance between service and learning

Service-learning strives to achieve a balance between service and learning objectives; in service-learning, partners negotiate the differences between their needs and their expectations. Service-learning places an emphasis on addressing community concerns and grows from authentic partnerships between communities and schools. Importantly, service-learning emphasizes *reciprocal learning*. In service-learning, traditional definitions of "faculty," "teacher" and "learner" are intentionally blurred. Everyone becomes a learner. In emphasizing *reflective practice*, service-learning facilitates students making the connection between practice and theory and fosters critical thinking. Finally, service-learning places an emphasis on *developing citizenship skills and achieving social change*. In service-learning, students place their roles as future citizens and professionals in a larger societal context. In sum, service-learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.

In general, authentic service-learning experiences have several common characteristics (Eyler and Giles, 1999). They

- are positive, meaningful and real to the participants.
- involve cooperative rather than competitive experiences and thus promote skills associated with teamwork and community involvement and citizenship.

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- address complex problems in complex settings rather than simplified problems in isolation.
- offer opportunities to engage in problem-solving by requiring participants to gain knowledge of the specific context of their service-learning activity and community challenges, rather than only to draw upon generalized or abstract knowledge such as might come from a textbook. As a result, service-learning offers powerful opportunities to acquire the habits of critical thinking; i.e. the ability to identify the most important questions or issues within a real-world situation.
- promote deeper learning because the results are immediate and uncontrived. There are no "right answers" in the back of the book.
- are reciprocal in nature, benefiting both the community and the service providers by combining a service experience with a learning experience.

In 1990, the Corporation for National and Community Service said that service-learning:

- Promotes learning through active participation in service experiences
- Provides structured time for students to reflect by thinking, discussing and/or writing about their service experience
- Provides an opportunity for students to use skills and knowledge in real-life situations
- Extends learning beyond the classroom and into the community
- Fosters a sense of caring.

As a consequence of this immediacy of experience, service-learning is more likely to be personally meaningful to participants and to generate emotional consequences, to challenge values as well as ideas, and thereby support social, emotional and cognitive learning and development.

Service Learning is comprised of several specific steps or components that can be thought of as spokes of a wheel. This suggests that the process is a non linear one and one in which entry occurs along any of the supporting spokes.

The spokes consist of the following components:

1. Establish the community-campus partnership
2. Articulate learner outcomes and competencies
3. Select texts and other learning resources
4. Plan course instruction and activities
5. Design course evaluation and improvement plans
6. Build course or program infrastructure
7. Sustain and maintain course and activities
8. Practice cultural humility
9. Develop community-engaged scholarship

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Examples

Brief composite example: Students may be placed with a community-based organization for which a clean environment is a priority and thus find themselves collecting trash from a streambed. If they simply collect and dispose of the trash, they are providing a highly valued and important service to the community as volunteers. If they take further steps to analyze what they have found and possible sources so they can share the results with residents of the neighborhood along with suggestions for reducing pollution, however, they are beginning to engage in service-learning. The students are providing an important service to the community AND, at the same time, learning about water quality and laboratory analysis, developing an understanding of pollution issues, learning to interpret science issues to the public, and practicing communications skills by speaking to residents. In service-learning, they also would reflect on their personal and career interests in science, the environment, public policy or other related areas as well as their thoughts and feelings about pollution and environmental justice. Thus, service-learning combines service with learning in intentional ways.

Detailed domestic example: Placing students in community organizations and settings for specific learning experiences needs to grow from partnerships between the academy and the community. Given what for at least some schools has been a troubled town/gown relationship, knowing the historical legacy of this relationship is fundamental to developing balanced, respectful partnerships for learning. While becoming acquainted with and acknowledging elements of this historical legacy, faculty can identify organizations with which they might develop partnering arrangements for service-learning. Partners particularly well situated for helping students understand the principles of public health as well as the role and function of epidemiology are local county, city, and/or state health departments. It is in these health departments that much of the core activity related to public health is carried out. Because these departments are often understaffed and so having a competent, energetic student can be a benefit, even with the added responsibility of precepting that student. Faculty should not view this first step lightly, however, for developing and nurturing partnerships with community organizations is a time consuming endeavor; it often requires months of getting to know one another and of conversations that lay the groundwork for long term relationships built on trust and respect.

Specifying learner outcomes and competencies is a key element in service-learning education. Taking time to articulate student learning goals helps ensure that the experiential elements provide opportunities that move from volunteerism to true service-learning. Working with their community partners, faculty should specify learning and service objectives as well as separate service-learning objectives. To help prepare students for experiences in a range of public health agencies and organizations, the course materials should include background information at the micro level (specific about the history of the organization, as well as the people with whom it works) as well as the macro level (roles and functions of public health broadly).

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Students placed in a health department to work on issues related to a high incidence of babies born with low-birth weights might have as a learning objective to identify the conditions that contribute to babies being born with low birth weights. The service objective might be to work with the department's Healthy Start Initiative, providing supportive services to mothers and their newborns. The service-learning objective might be to work with advocates to write a policy statement aimed at ensuring that an adequate and accessible supply of primary prevention and health promotion services are available for women.

When placing students in public health agencies, faculty are often challenged by the need to allow community needs and interests to contribute to determining the scope of students' activities. Accustomed to control in the higher education classroom, faculty must find ways to become comfortable with sharing that control. Community partners are key to helping students expand their frames of reference and understanding so that they are more comfortable and competent working with members of communities, especially if those members come from communities different from their communities of origin. Additionally, it is often the community partners who enable students and faculty alike to see the resources and assets that are present in any community, no matter how distressed.

For the course to be a service-learning course, a bridge—usually consisting of reflection activities—must be present to make the explicit link between service and learning. Methods for reflection include: dialogue, keeping a journal, photo-voice, and electronic discussion groups. In the example of students placed with a health department to work on issues related to reducing the incidence of babies born with low birth weights, students could benefit from keeping a journal in which they record their thoughts and feelings about why women find themselves unable to obtain recommended prenatal care services. They might also ponder why a certain array of services are more available in some communities than in others, why some women might be fearful and mistrustful of the medical and public health establishment, why certain women enter child-bearing years healthy and fit while others enter these years with their health status compromised. In addition to keeping journals, students might also engage in small group discussions where they can share their perspectives and experiences, including exploring their own values, beliefs and stereotypes.

Every course benefits from having course evaluation and improvement plans. In the case of service-learning courses, this means that in addition to faculty and students who traditionally assess and comment on a course, community preceptors and sometimes community beneficiaries of the students' endeavors are also encouraged to provide feedback. For example, in this case of students placed with a health department to work on improving health through interventions to reduce the incidence of low-birth weight among new borns, health department personnel as well as community members with whom the students worked would be invited to provide systematic feedback.

Developing a new course requires complying with institutional policies and procedures for offering new courses. Faculty will need to determine whether the course will need

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curriculum committee approval or whether the course could be considered a revision of an existing one. Gaining support for the service-learning course from deans, department leaders, faculty, students and community partners can be helpful in the early part of this approval process. Areas to consider in building support include benefits/risks to the institution and the community, how the course can help students achieve specific competencies, and identifying colleagues or partners who can be helpful. One should not underestimate the amount of time required to develop and teach a service-learning course: it is greater than a traditional in-class lecture course and requires a high degree of ongoing face time between instructor and community preceptor. Faculty on campuses with offices of service-learning or of community partnerships should use these resources.

Additional resources can be found in state campus compact organizations as well as area health education centers (AHECs). AHECs are multi-institutional, multidisciplinary, community-based programs that work with community and academic partners to address the primary care health workforce needs as well as health promotion and disease prevention needs of medically underserved communities.

Placements in health departments and in any of many other community-based public health organizations will expose students to the issue of health disparities and the nation's goals to eliminate them. Before being placed in a community agency, students might complete a self-assessment of their own cultural awareness, learn more about cultural groups with which they will be working, and be encouraged to discuss their feelings and human tendency to stereotype as part of their reflective journals.

Service and service-learning can become areas of excellence and an asset in faculty promotion and tenure when they become scholarship. The Report of the Commission on Community-Engaged Scholarship in the Health Professions defines community-engaged scholarship as “scholarship that involves the faculty member in a mutually beneficial partnership with the community. ...[it] can be transdisciplinary and often integrates some combination of multiple forms of scholarship. ...service-learning can integrate the scholarship of teaching, application, and engagement...” In developing service-learning in undergraduate education, faculty should be aware of opportunities to use the experiences to inform their teaching, research, and service.

Brief Global Example: Students travel to Ecuador to learn about that country's rural healthcare system and to contribute to it through providing extra pairs of hands. They have no clinical experience, but orientation in the US helps provide them with useful, basic health information. While helping out in the local hospital, the students meet residents of a very impoverished neighborhood that has one day-care center for 40 children under the age of 5. The students learn that 85% of the community's population is under the age of 13 and that there are very few adult males. They also observe that the families' source of water is a large concrete structure into which a truck dumps water each day. Children fetch water and carry it up the hill to their household's water barrels. The water is contaminated, causing many water-borne medical problems.

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Every morning, helped by local nursing students, the American students give a "charla" (an informal, interactive talk/discussion) with the community's women and children. While several students entertain the children, others give talks that include topics such as basic family planning, nutrition, maternal lactation, anemia, diarrhea/oral rehydration, and parasite prevention. After the talks, students work with clinicians, helping them take basic histories from patients and give vitamins, iron, and anti-parasitic medication/creams. This is the first time any medical care has come to this community.

Observing the difficulty residents have obtaining clean water, the students communicate with international organizations whose mission includes community development. Ultimately, working with local leaders, they are able to act as catalysts for the development of a water project that will result in residents being able to have clean, running water.

This example shows how students who are oriented to service-learning can feel they have the freedom to learn about a community need and work with local leaders to address that need. Intending to learn about and to contribute to uncomplicated functions related to primary care in a basic clinic, the students' larger contribution was initiating a major water project. Through reflection exercises that included keeping a journal and expressing themselves through photography, the students addressed their fears related to living in a culture different from their own, having to communicate in a language other than English, and pushing themselves beyond their comfort zone. Their journal entries also show the powerful effects of living in an impoverished community and of playing a significant role in helping people obtain a resource taken for granted in developed countries.

They begin to ask the universal questions about their own privilege and others' lack of it, why some are born into comfort and others are not. They expand their ability to feel empathy as well as to marvel at the perseverance and hope of people living in dangerous, disease producing environments. They feel the joy of being able to contribute to improving others' lives and knowing that they have been able to make a difference.

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Selected Web Sites

www.northwestern.edu/ipr/abcd.html Asset-based community development institute

www.astho.org The Association of State and Territorial Health Officials

www.compact.org Campus Compact

www.healthycommunities.org Coalition of Healthier Cities and Communities

www.communityhealth.hrsa.gov Community Health Status Indicators

www.ccpb.ino Community-Campus Partnerships for Health

www.health.gov/healthypeople Healthy People 2010

www.naccho.org The National Association of County and City Health Officials

www.georgetown.edu/research/gucdc/ncc National Center for Cultural Competence

www.nlm.nih.gov National Library of Medicine

www.service.learning.org/resources_tools/publications/index.php National Service Learning Clearinghouse

http://www.servicelearning.org/resources/fact_sheets/he_facts/index.php National Service-Learning Clearinghouse fact sheets on service-learning in higher education

www.gseis.ucla.edu/slc/reflection.pdf Resources for reflection

www.scholarshipofengagement.org The Scholarship of engagement

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http://www.aacu.org/public_health/curriculuminputform.cfm

www.phf.org/Link/acasurvey.pdf The Public Health Foundation's instruments can be used to assess the status and composition of partnerships between academic institutions and health departments and community-based organizations.

<http://depts.washington.edu/ccph/servicelearningres.html> For service-learning resources

<http://depts.washington.edu/ccph/servicelearningres.html> For service-learning in public health resources

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Part IV. Innovative Teaching Methods

By Nancy Alfred Persily and Susan Albertine

This section defines and describes integrative learning activities that aim to achieve the learning outcomes of the core curriculum. As the project leadership writes in “Back to the Pump Handle”: “We argue in favor of teaching and learning about public health—emphasis on lowercase *p* and *h*—Holding up the lens of population study, or population science, and taking a look through it at the disciplines of the arts and sciences and then inviting the arts and sciences to take up that lens themselves and see what they discover.” (*Liberal Education*- AAC&U, October 2007 in press)

Every day we experience the world, seeing information about public health but not recognizing it for what it is. Using literature and the arts, the social sciences, and the sciences, we can prompt undergraduates to see how ever-present the realities of public health are in our world. Educated citizens can make the leap between their studies and the world around them. We are trying to articulate in this section how to connect the liberal arts and public health in the world.

In addition we are trying to prompt students to think about ways that they can act and make choices as citizens—not just to learn how to see public health issues and problems but also to learn how to make individual decisions that can improve one’s own life and also contribute to public wellbeing. Ibsen’s Enemy of the People, for example, can prompt recognition of a public health problem in a community, using the vehicle of theatre. It can also prompt reasoned choices and individual action. It’s not a stretch for liberal arts faculty to see the centrality and importance of public health in the contemporary world. Many interdisciplinary scholars have been arriving at that interest independently.

Because every undergraduate should have access to education in Public Health, a model of health that emphasizes the linkages and relationships among multiple factors (or determinants) affecting health or an ecological model, public health concepts can be taught as an essential part of educating citizens and can emphasize that it is immediately pertinent to a number of professions. Public health literacy entailing recognition and basic understanding of how health is shaped by the social and physical environment is an appropriate and worthy social goal and can be achieved through a multidimensional course which incorporates public health readings with current events, literature, film, streaming videos, internet research, case studies and lectures by public health professionals.

The learning activities in this section are intended to prompt or inspire creative connections between fields and disciplines. Using sample models, we will explore some avenues that may yield deeper understanding and expression of learning that integrates public health knowledge and awareness into life experience, using the disciplinary knowledge, skills, and attitudes of the humanities. These curricular innovations can be

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applied to any course, Public Health 101, Epidemiology 101, Global Health 101 or a specific course which concentrates on linking public health to the humanities such as the course From Cholera to Cancer (available at www.).

Any Public Health professor can integrate the humanities, for example, into courses. Alternatively, any humanities professor can integrate public health into other courses. Ideally, an integrative program will enable faculty to work in interdisciplinary and multidisciplinary teams. We are not asking faculty to assume expertise that they do not possess. Rather, we recommend a firm disciplinary grounding in the approach to teaching and an openness to the perspectives of other disciplines or of inter- and multidisciplinary points of views, to maintain disciplinary integrity and open up interdisciplinary/multidisciplinary doors.

Much of history, philosophy, literature, economics, politics, and film reflect public health issues that affect everyday life. Historical beginnings in public health and epidemiology can be found in various forms of literature; the impact of public health achievements is all around us. Economics and politics affect decisions in changing public health policies. Examples can be found in historical literature (*An Enemy of the People*) as well as current literature, film and documentaries (*An Inconvenient Truth*, *Polio: A Paralyzing Fear*, *Mountains Beyond Mountains*; *And the Band Played On*).

Emerging infectious diseases and their impact on global health are found not only in public health literature, but also in films (e.g. *The Constant Gardener*, *Yesterday* (a story about HIV/AIDS in South Africa and the first Zulu produced film), literature (*Mountains beyond Mountains*), current events (articles in newspapers e.g. *New York Times*, *Wall Street Journal* and magazines such as the *New Yorker* and *Vanity Fair*).

The impact of special interest groups on public health research and treatment of various illnesses and conditions can be seen not just in scientific literature, but in a variety of venues(political lobbying, public interest films, commercials, law cases).

Recognizing a host of public health issues (tobacco, gun use, violence, automobile safety, mental health, teen pregnancy, HIV/AIDS) in literature and films and in current events, makes public health more relevant to the average college student. The idea of an educated citizenry and the fact that one person can “make a difference” in the elimination or prevention, control and minimization of the adverse impact of communicable diseases, environmental health problems, and the prevention and management of disasters can be demonstrated through case studies, fiction, biographies and other scientific and popular literature.

Chronic physical and mental disease increasingly represents the predominant impacts on mortality and morbidity both domestically and world-wide. Examples can be found throughout literature and film, and challenges to address these issues should be discussed by students on a variety of levels and through a host of case studies and life experiences.

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Learning Activities:

Literature:

Use of plays, novels, biographies, poetry:

Example:

Enemy of the People by Henrik Ibsen takes place in the 19 century. The story is about a Public health director who wants to close the spas in his small town because they are polluted. The town council votes to keep the spas open because this is their main source of income and the town will suffer economically if, indeed, they are closed down or even if the word gets out that the spas are polluted.

This reading is supplemented by articles from current public health literature about environmental health investigations and interventions. Once the students have read this play, and have supplemented it with these public health readings, a lively discussion can be initiated asking the following suggested questions:

Is *Enemy of the People* a representation of a moment in time, is it an historical document?

What do you think was Ibsen's motivation to write a play with this theme?

How does this play relate to current times? To other environmental catastrophes?

To environmental justice issues?

What would you have done to intervene in this case?

How do economics and politics affect decision making?

What information would you need to judge a potential environmental impact?

Example

The Poem "To Grow On" by Marge Piercy was first published in 1969, one year before lead paint was finally banned in the United States. Marge Piercy creates a compelling picture of social injustice. A baby in its crib reaches for spring sunlight... "a room where chips of pretty paint snow on the crib". The baby's small fingers uncoil like germinating beans and we realize that it is being poisoned, it fingers "test tubes."

The story of lead paint in the United States is one of a growing number of cases in which the public's health is threatened by a lucrative product. Evidence of lead paint's poisonous effects on children started to emerge in the early 1900's, but of course, there was not public health surveillance in place to measure its overall damage. As further scientific evidence emerged, the Lead Industries Association cast doubts on the scientific validity of these studies and also exerted political pressure against any restrictions. The U.S. didn't formally ban lead paint until 1970. Although numbers of lead poisoned children have dramatically declined due to a number of public health interventions, the legacy of this health hazard persists. (Carol Young, Ph.D., UAlbany School of Public Health)

Suggested Questions:

What does this poem mean to you?

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Does the poem have value as a work of art?
How does the poem use artistic expression as a means to an end?
What is lead poisoning?
What kind of public health interventions have been developed to address lead poisoning in children?
What would you propose?
What other public health problem has a similar history?
What recent current events have brought the issue of lead poisoning into the headlines?

This reading can be supplemented with various readings from public health literature, newspaper articles relating the incidence of lead based paint in children's toys, and an interview with Herbert Needleman (*Public Health Reports*, May-June 2005). Herbert Needleman, M.D. is a pediatrician, an activist and a pioneer who has helped transform our understanding of the effect of lead on children's health. "Standing Up to the Lead Industry: An Interview with Herbert Needleman," shows students what an educated person can do to influence public policy and help ensure the public's health.

Debates

The use of student debates in the classroom can be a very effective learning tool. Selected students or volunteers from the class can debate a variety of public health issues. By taking a stance for or against, students recognize that there are not clear-cut answers to solving public health problems and that economics, politics, and culture all affect decision making.

Example:

A unit on Cancer and other chronic illnesses can include articles on smoking and lung cancer and the impact of smoking on cardiovascular illnesses. Perhaps the students can be assigned the film, "Thank You for Smoking." Class may debate the proposition that all tobacco products should be banned in the United States. The students will have prepared their presentation beforehand having done appropriate research (it is good to have a list of sources used from each participant). The audience (rest of students in the class) should have some time to ask questions of the debaters.

Press Conference

Students will have read assignments beforehand regarding a public health issue such as gun control. A guest speaker presents the epidemiology of accidental deaths, firearms and politics. Students from the audience fire prepared and spontaneous questions at the speaker in a press conference fashion. The instructor or a student chosen from the class serves as moderator.

Video and Films

Several schools of public health, the Centers for Disease Control and Prevention and state health departments have developed streaming videos, self teaching exercises and

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films on various public health topics. Many of these are in the public domain and others are sold at minimal cost. Many come with discussion guides as well. These are excellent tools to be used in class or as homework assignments, along with articles posted on the internet by organizations such as the Association of Schools of Public Health Delta Omega Series. Some continuing education videos and films are: Orientation to Public Health (streaming video); Overweight and Obesity: Frequently Asked Questions (CDC Fact Sheet); Avian Influenza (grand rounds broadcast), Healthy Schools (film/video). These materials are excellent supplements to films, literature and basic journal articles and texts.

Case Studies

An excellent in-class experience is to break the class up onto groups of 4-6 students who will be assigned a case study in a specific area of public health. An excellent resource is newspaper articles. Students are given a list of questions to answer and are asked to report back to the entire class. The group chooses a member to report out their findings.

Suggested questions to be asked:

Summarize the case, including data presented.

What are the public health implications?

What would you do to address this problem?

How do you relate this problem to the books, films, and articles you have read?

Having students write their own case study or short story may be a challenging and innovative activity for students. These narratives can bring to life topics as diverse as HIV/AIDS and the obesity epidemic.

Current Events

To demonstrate that public health issues surround us, a few students can be assigned or volunteer (on a rotating basis) to bring in a current article from the newspaper on a public health issue... from global warming, to emerging infectious diseases to access to health care. Similar questions to those listed above should be assigned to the student. Students present first before the lecture or other discussions begin. This activity helps the student to become an educated citizen and to understand the relevance of public health to everyday life. Make sure the student focuses on the population based perspective and the ecological basis of these issues and not solely on personal health. Invest time to find examples in literature and the arts.

Relevance to Students' Daily Lives

For students just beginning their study of public health it can be useful to walk through their day and identify activities, many of which they take for granted, that represent important public health contributions or issues. For instance

- personal hygiene and sanitation (use of toilet, shower and teeth brushing)
- safe food and water (drinking water, refrigeration)
- protecting health (smoke detectors, asbestos abatement)
- environmental pollution control (clean air and water)
- product safety (cars, jewelry, electronics)

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- risk factor reduction (smoking, exercise, safer sex)

Contemporary literature and film provide an array of examples; historical readings, comparing pre- and post-industrial literature, for example, can be richly rewarding when the context of discussion is human health. Deeper interpretations of literature yield insight into phenomenology. Theories of narrative address story-telling about health and disease. Literary study through a range of modes, theories, and approaches will readily address questions of human health and sustainability.

The activities above can form the basis for an interdisciplinary curriculum in public health. Alternatively these activities can be integrated into the core public health courses outlined in this curriculum guide. Regardless of the specific use of these approaches it is important that students come to view public health from a broad interdisciplinary or ecological approach and appreciate the presence of public health issues in current events and in their daily lives. Literature and the arts, which allow students to step back and see the big picture, have important roles to play in teaching and in learning public health.

Additional Innovative Teaching Methods-

As an emerging field of study undergraduate public health provides an excellent opportunity to adopt traditional and emerging teaching methods. For instance field trips are a traditional teaching method used for generations in public health. Trips to waste and water treatment plants, Red Cross blood banks and disaster planning sites and an array of service delivery sites provide thought provoking and memorable experiences for students. A reflective curriculum that integrates these experiences into a larger framework is needed to maximize the benefits of these types of fieldtrips.

New technologies for organizing and delivering educational materials such as Blackboard and similar internet based communications systems provide a platform for a range of innovative methods. Discussions that encourage students to think together about questions for which their life experience provides important expertise such as the reasons for childhood obesity or ways to prevent tobacco additions among teenagers may be particularly effective discussion questions. Web based discussion may be linked to classroom assignments such as “Based on the film the Constant Gardner what do you believe are the roles and responsibilities of pharmaceutical companies in testing drugs in developing countries?”

Faculty who teach undergraduate public health are strongly encouraged to provide feedback on this Curriculum Guide and to provide additional examples of innovate teaching methods that may be incorporated into subsequent version of this curriculum guide.

Please provide feedback at the following site:

http://www.aacu.org/public_health/curriculuminputform.cfm

Part V. Epidemiology 101 – Epidemiology Laboratory

The recommendation of the Consensus Conference on Undergraduate Public Health Education and this curriculum guide indicate that epidemiology should aim to teach fundamental principles of the scientific method. To accomplish this goal and fulfill a science distribution requirement, many institutions will require that Epidemiology 101 include a laboratory.

An interactive computer based laboratory in epidemiology can be conducted using a range of existing resources. Two existing web site that are available free of charge provide case based materials that can be organized to illustrate the Epidemiology 101 curriculum framework and may be useful for organizing an epidemiology laboratory.

The Young Epidemiology Scholars (YES) materials were produced by the Robert Wood Johnson Foundation and the College Board. Though originally designed for high school students, the materials are often quite appropriate to provide interactive exercises and solid grounding for students in Epidemiology 101. The following provides direct links to YES cases organized using the structure of the recommended Epidemiology 101 curriculum framework.

Framework for Epidemiology 101 Use of Young Epidemiology Scholars Materials Hyperlinked

I. History, Philosophy, and Uses of Epidemiology

1. Historical contributions of epidemiology
 - [Examining the Plague: An Investigation of Epidemic Past and Present](#)
 - [Mortality and the Transatlantic Slave Trade](#)
 - [Casualties of War: The Short- and Long-term Effects of the 1945 Atomic Bomb Attacks on Japan](#)
2. Current uses of epidemiology
 - [Disease Outbreak Investigation \[lesson #3: the leukemia cluster described in *A Civil Action*\]](#)
3. Ethics and philosophy of epidemiology
 - [Ethical Issues in Epidemiology](#)
 - [Should the Population Be Screened for HIV?](#)
 - [The Tuskegee Syphilis Study](#)

II. Descriptive Epidemiology

1. Condition, Frequency and Severity -
case definition and populations; incidence, prevalence, case-fatality
 - [Descriptive Epidemiology of Births to Teenage Mothers](#)
 - [Mortality and the Transatlantic Slave Trade](#)
2. Data and Disease - vital statistics, surveillance and measures of health status
 - [Descriptive Epidemiology of Births to Teenage Mothers](#)
 - [Cross-Sectional Study Design and Data Analysis](#)
3. Generating hypotheses

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Patterns of Disease - person, place, time; changes and difference in rates;
exposure; incubation period; disease spread

[Mortality and the Transatlantic Slave Trade](#)

[An Outbreak of Legionnaires' Disease](#)

[Outbreak Investigation in a Vermont Community Hospital](#)

III. Association and Causation

1. Estimation - measures of the strength of the association, graphical display of data; risk, relative risk, attributable risk

[Measures in Epidemiology](#)

[Attributable Risk Applications in Epidemiology](#)

2. Inference - concepts of statistical significance and confidence intervals

[Cross-Sectional Study Design and Data Analysis](#)

- 3 Bias and Confounding – information and selection; adjustment; effect modification

[TV and Aggressive Behavior](#)

[Observational Studies and Bias in Epidemiologic Research](#)

[Confounding in Epidemiology](#)

[An Outbreak of Legionnaires' Disease](#)

4. Causation – risk factors and other determinants of diseases and conditions

[Alpine Fizz and Male Infertility: A Mock Trial](#)

[Web of Causation](#)

[TV and Aggressive Behavior](#)

[Attributable Risk Applications in Epidemiology](#)

[An Outbreak of Legionnaires' Disease](#)

5. Efficacy of Interventions

[Adolescent Suicide: The Role of Epidemiology in Public Health](#)

IV. Analytical Epidemiology

1. Ecologic/ Population Comparison - populations as the unit of analysis

[Ecologic Studies](#)

2. Case-control and Cross-sectional

[Case Control Study](#)

[Cross-Sectional Study Design and Data Analysis](#)

[TV and Aggressive Behavior](#)

[Observational Studies and Bias in Epidemiologic Research](#)

[Adolescent Suicide: The Role of Epidemiology in Public Health](#)

[An Outbreak of Legionnaires' Disease](#)

3. Cohort - prospective and retrospective

[Observational Studies and Bias in Epidemiologic Research](#)

[Casualties of War: The Short- and Long-term Effects of the 1945 Atomic](#)

[Bomb Attacks on Japan](#)

[The Tuskegee Syphilis Study](#)

4. Experimental studies - randomized clinical trials and community trials

[Testing Ephedra: Using Epidemiological Study to Teach Concepts of the](#)

[Scientific Method](#)

V. Evidence-Based Public Health- Evidence-Based Recommendations

Please provide feedback at the following site:

http://www.aacu.org/public_health/curriculuminputform.cfm

1. Harms and Benefits - decision analysis and perceptions of risk and benefits

[Risk Perception](#)

2. Cost-effectiveness

[Bicycle Helmet Effectiveness in Preventing Injury and Death](#)

VI. Applications to Policy, Basic and Clinical Sciences

1. Outbreak investigation

[Disease Outbreak Investigation](#)

[An Outbreak of Legionnaires' Disease](#)

[Outbreak Investigation in a Vermont Community Hospital](#)

2. Testing and Screening

[Screening and Diagnostic Tests](#)

[Should the Population Be Screened for HIV?](#)

3. Public health policy

[Epidemiology and Public Health Policy: Using the Smoking Ban in New York City Bars as a Case Study](#)

A second useful web site is Epiville which is an ongoing project of the Columbia University Mailman School of Public Health. It is designed to accompany an introductory graduate course in public health. Many of the cases are well suited to undergraduate public health education and can be used to accomplish many of the advance learning objectives. The following outlines the Epiville cases using the Epidemiology 101 curriculum frameworks and provides direct links to these cases:

Descriptive Epidemiology

<http://ccnmtl.columbia.edu/projects/epiville/study3a.html>

Analytical Epidemiology

Case Control

<http://ccnmtl.columbia.edu/projects/epiville/study1a.html>

Cohort Study

<http://ccnmtl.columbia.edu/projects/epiville/study2a.html>

Randomized Clinical Trial

<http://ccnmtl.columbia.edu/projects/epiville/study2a.html>

Association and Causation

Bias

<http://ccnmtl.columbia.edu/projects/epiville/study6a.html>

Confounding

<http://ccnmtl.columbia.edu/projects/epiville/study7a.html>

Causation

<http://ccnmtl.columbia.edu/projects/epiville/study9a.html>

Applications

Outbreak Investigation-SARS

<http://ccnmtl.columbia.edu/projects/epiville/study4a.html> and

<http://ccnmtl.columbia.edu/projects/epiville/study5a.html>

Please provide feedback at the following site:

http://www.aacu.org/public_health/curriculuminputform.cfm

Clinical Sciences- Screening

<http://ccnmtl.columbia.edu/projects/epiville/study10a.html>

Part V. Minors and Other “Coherent Curriculum”

The Consensus Conference on Undergraduate Public Health Education encouraged the development of minors in public health based upon the structure outlined in Box 3. This framework aims to build upon a consistent interdisciplinary core, provide choices for students based upon the strengths of particular institutions and encourage experiential learning such as service-learning as an integral part of all minors.

Box 3: Generic Structure for a Minor in Public Health

Required Interdisciplinary Core

- Public Health 101
- Epidemiology 101
- Global Health 101

Selectives*-

- Discipline specific or interdisciplinary courses determined by the institution and the student
- Departmental or inter-departmental public health related courses based on the interests and strengths of each institution

Experiential Learning- Health Related Activities e.g.

- Service-learning
- Capstone or synthesis project
- Structured research and/or study abroad

*Examples of selective courses include: Health Behavior – Psychology; Biostatistics – Mathematics or Statistics; Health Policy & Law-Political Science, Sociology; Environmental Health – Environmental Sciences, Biology; Biology for Public Health/ Infectious Disease – Biology, Biochemistry, Microbiology or other biological sciences; Health Economics – Economics. Examples of interdisciplinary courses e.g.: Organizational Theory and Public Health Practice- Sociology, Management; Women’s Health – Women’s and Gender Studies, Sociology; Addiction Studies – Biopsychology, Neuroscience; Environmental Policy and Justice – Political Science and other Social Sciences; Health Communication – Communication Studies, Journalism; Health and Development – Economics, Geography, Anthropology; Health and International Human Rights – Philosophy, Sociology, Political Science; Sexuality Studies – Psychology, Anthropology, Woman’s Studies. A wide range of interdisciplinary courses are also encouraged.

Institutions may choose to develop undergraduate public health education beyond general education using a variety of structures including minors, undergraduate certificates, and majors. In developing these options the Association of Schools of Public Health’s Education Committee has made advisory recommendations as follows:

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**Association of Schools of Public Health Education Committee
Advisory Recommendations
November 2007**

The Association of Schools of Public Health Education Committee encourages colleges and universities without an accredited School or Program in Public Health to establish introductory undergraduate public health curricula based upon the following principles:

1. Develop core courses such as “Public Health 101”, “Epidemiology 101”, and “Global Health 101” based upon the ASPH Task Force on Undergraduate Public Health’s *Statement on Recommended Content for an Introductory Undergraduate Public Health Course* and the recommendations of the Consensus Conference on Undergraduate Public Health Education.
2. Encourage well designed academic minors that build upon core curricula, include elective public health courses that take advantage of institutional strengths, and include options for experiential learning as recommended by the Consensus Conference on Undergraduate Public Health Education.
3. Institutions without accredited Schools or Programs in Public Health should ensure adequate depth and breadth of faculty and financial resources and/or work with an accredited School or Program in Public Health before pursuing an academic major in public health.

In terms of the development of academic minors, the report of the Consensus Conference on Undergraduate Public Health Education including the following discussion of academic minors:

Academic minor programs in public health are under development in institutions across the country. An array of related programs in societal health and applied ethics are finding places on college and university Internet and intranet sites. These programs signal the emergence of a new category of interdisciplinary initiatives, including both a minor and a major in arts or science. Public health minor programs are overwhelmed by demand, with students packed into any available seats or in certain cases, unable to get a seat. (ASPH and APTR unpublished data 2006). Although counting the programs is challenging, Internet searches indicate both activity and potential for future development.

These new minors are of two basic types: minors sponsored by public health units (i.e., schools, colleges, departments, or programs) and minors developed as interdisciplinary

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ventures within, primarily, schools of arts and sciences. Nursing schools might have expertise sufficient not only to participate but also to lead such initiatives. Other health science or allied health schools might participate in both types of programs and provide leadership.

Although the two models differ, as discussed in the following, sponsors of programs and those in planning unite in enthusiasm and agreement with the objectives of the Consensus Conference. Both professional schools and arts and sciences leaders see value in real-world experience gained through public health minors. They agree in emphasizing the benefits that should be accessible to all undergraduates. They seek opportunities for local and global application of knowledge and analytic skills, experiential learning linked to civic engagement, practice of applied ethics, problem solving, and team work from a population perspective. They want to instill public health knowledge, understanding, skills, and attitudes into general and liberal education, with the goal of an educated citizenry. Students should, in this sense, understand public health as a way of thinking and of knowing the world.

Knowledgeable leaders want students to grapple with ecologic or systemic understandings of human rights and health care in diverse global societies. Meanwhile, working group members want to encourage public health professionals to embrace the LEAP learning outcomes as central to undergraduate education.

Across the spectrum, leaders understand that public health minors have currency. These programs interest undergraduates who are paying attention to the world. Health topics introduce a new and highly relevant approach to global understanding within undergraduate majors. Public Health 101 and Epidemiology 101 serve as options or electives in selected majors or as general education courses. More importantly, such courses have potential for reshaping a student's outlook on his or her own discipline, even those as apparently unrelated as the humanities. One has only to imagine a major in Spanish geared to the health professions or a major in philosophy with an emphasis on human rights to see the possibilities.

Ongoing world challenges intensify that interest. Environmental degradation and disasters, biologic and chemical terrorism, pandemic disease, and population dynamics (e.g., immigration, depopulation, effects of prolonged warfare) all are topics of concern to undergraduates. They often seek avenues to socially and globally responsible work within vulnerable populations and communities, and they understand the need for an educated citizenry.

Undergraduate students, those in arts and sciences in particular, are also hungry for career options related to their majors, and they want to explore programs that might lead to graduate and professional school. The public health minor educates citizens and opens both pathways and alternatives to medical school among the many health-related professional fields.

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Undergraduates often enter arts and sciences majors unaware of the array of health professions that might later be right for them; they frequently enter the life sciences with unrealistic plans of becoming physicians. In health professional undergraduate schools, students across the spectrum find public health knowledge and practice essential to their success in these rapidly changing fields. All participants in the working group shared this awareness, and it emerged as a point of agreement as well at the Consensus Conference. The challenge, all agreed, is to find models that work for the majority of institutions that have not experienced the importance and potential of public health within undergraduate education.

Defining a Minor Program

Although no national model exists for minor programs, discussion at the Consensus Conference identified certain widely recognized features. Minor programs are typically half the size of major programs in arts and sciences. In a school that counts course units, a typical major requires 10–12 courses. The typical minor requires four or five courses, perhaps including a partial-unit practicum. In a school that counts student credit hours, the minor might require approximately 21 semester credit hours or seven courses. Minor programs often require two to four foundational courses (depending on how credits are counted) and then offer an array of approved electives. Certain minor programs culminate in a capstone course or practicum, and others require applied or experiential learning.

Minor programs are usually designed to do something other than provide a truncated version of a major. College or university departments sometimes rely on minors to boost course enrollments by introducing students from outside the department to a new field or to provide foundational work in fields where a major might be too costly or enroll too few degree students. When minors are related to the student's major field or discipline, they deepen arts and sciences education and open a subfield or specialization, which can lead toward a profession. Minor programs not directly related to the major will enhance liberal education through breadth and contrast. Exploration of an unrelated field can likewise contribute to lifelong learning and career planning.

Two Models

Public Health Model for Universities with Public Health Schools or Programs

Consensus Conference participants discovered that the majority of minor program development has occurred at universities having public health schools or programs. As graduate schools and programs in public health extend degrees to undergraduates, faculty soon realize that undergraduate minor programs are potentially fruitful recruiting grounds for master's in public health students and other health professional programs.

Consensus Conference participants affirmed the goals of educating the future citizenry through such programs, beyond opening a pathway to the health professions and public health. The conference identified multiple programs that are opening new avenues to

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undergraduates from a base in public health. For example, Boston University (1), Temple University (2), and the University of Virginia (3) — all with schools or programs in public health — have developed successful minors open to undergraduates that are especially attractive to arts and sciences students. As noted previously the interdisciplinary degree in public health at Johns Hopkins University has in recent years become the largest or second largest undergraduate major in arts and sciences.

A public health minor might begin by situating all courses in the public health unit. It might employ unit faculty exclusively and recruit students majoring in arts and sciences. Course content may emphasize health care from a population perspective. The population perspective of public health shapes the minor in this model. However, variations exist on the model, as exemplified by recent interschool collaborations. Certain programs bridge public health and arts and sciences, offering courses through both units. For example, Boston University's School of Public Health has launched a successful College of Arts and Sciences public health minor, enrolling undergraduates side by side with public health graduate students in graduate public health and epidemiology courses. The university provides a shuttle bus to bring undergraduates to the public health campus.

A new minor in global public health at the University of Virginia is anchored in public health in their medical school and dedicated to undergraduate education in arts and sciences with an emphasis on global knowledge and experience integral to the university's arts and sciences education program. A central goal of the program is to prepare and send undergraduates abroad for experiential or service learning. Programs of this design, with the public health unit located in a school of medicine or as a separate unit, for example, might develop a minor first and consider a major second or decide not to pursue a major at all. Interdisciplinary course designs might require that the minor program share administrative responsibility, course content, and joint faculty appointments between arts and sciences and the public health unit.

These bridge designs might emphasize public health theory and concepts within an array of disciplines more than they direct learning toward health-care practice. That is, collaborative or joint programs might tend more toward the theoretical and didactic than the clinical or health-care professional. They might become more inter- or multidisciplinary, according to the orientation of the arts or sciences.

Arts and Science-Based Model for Colleges and Universities Without Public Health Schools or Programs

This model is in the stage of creative ferment rather than full implementation. However, the Consensus Conference has identified encouraging signs of growth in both bachelor's degree and comprehensive institutions (i.e., those that offer bachelor's plus master's degrees). An interest in health-related programs is growing along with the increased interdisciplinary emphasis in arts and sciences. Experiential and applied learning activities now attract broad support in the liberal arts, which is a noticeable change. Innovative programs in such fields as health communication are beginning to find homes

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in the social sciences (e.g., the concentration in health communications at The College of New Jersey (4). Interdisciplinary projects (e.g., health and society, health studies, and medical or biomedical ethics) are appearing as concentrations, specializations, minors, and occasionally as majors within arts and sciences. New health sciences or health studies programs are discovering champions within the sciences.

Among comprehensive institutions, California State University, Fresno, and the State University of New York at Fredonia, for example, offer public health minors. San Francisco State University (SFSU), College of Health and Human Services, which offers a master's of public health degree, is breaking new ground that will be useful for comprehensive institutions without schools or programs (5). SFSU's Department of Health Education offers two minors based in public health (health education and women's health) and an array of population-based general education courses, including epidemiology and environmental health to fulfill integrative science requirements, and multiple social science courses in public health. A new minor program in public health at Muhlenberg College, a liberal arts college in New Jersey, might be the first of its kind (6). Although certain liberal arts institutions have created a limited number of specialized courses or concentrations, that interest is beginning to coalesce.

In the arts and sciences model, the liberal arts and departmental perspectives shape the minor. That is, the program might seek to strengthen global perspectives by enabling students to use the lens of public health and population study within and across disciplines. This objective differs somewhat from the goals of the public health-unit model, which tends toward professionalism and might focus on health-care applications. Unlike public health-unit models, arts and sciences-based programs might also integrate the humanities and social sciences into the sciences by introducing an international or global perspective.

Collaborative Efforts in Creating a Model

Innovative work in public health in liberal arts and comprehensive institutions will require contributions across the institution and within the regional community. Structures or administrative homes for minor programs can vary, provided that essential expertise in the field of public health is available. A department of philosophy with expertise in applied ethics and a willing faculty leader might host an interdisciplinary minor program, for example, by providing essential administrative support and program stewardship. In this case, a collaboration of departments should ensure that core or foundational courses are staffed and listed properly in appropriate departments (e.g., Public Health 101 in a social science department and Epidemiology 101 as a science e.g. biology). A faculty advisory committee might provide oversight and be organized by the lead faculty member from philosophy.

Alternatively, new programs might be housed in an interdisciplinary center (e.g., in the Center for Healthy Living at Western Washington University [7]). If a nursing school or another health science unit is available, a partnership might follow, drawing on the

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expertise of community or public health nursing faculty and community based public health practice professionals with a faculty appointment. Faculty with public health expertise will often be found in the local community through municipal, county, or regional public health departments, health systems, and hospitals.

The key to program development, all conference participants agreed, is public health expertise. If no faculty member holds a master's of public health degree, the institution should invest in consultation and team-teaching, along with faculty professional development, to bring that expertise from the outside and develop it from within. An institution might engage public health practitioners as adjunct faculty, which can be an optimal opportunity for the institution to acquire the expertise it needs and practitioners to gain status and benefit from joining the faculty.

Potential Collaboration with Arts and Sciences

Whichever the model, the new minor will require collaboration with faculty in arts and sciences. As discussed previously, an interest in interdisciplinary health programs is evolving naturally in arts and sciences. Any social science department observing events in the community is likely to hire faculty from a public health-related arena. Foundational work across the social sciences is often based on population studies, and bridges between the social sciences and public health are readily available. For instance faculty interested in narratives or ethnography are located throughout the humanities, anthropology, journalism, cultural studies, women's and gender studies, disability studies, film, communication, media or digital studies, and the arts. Studies of humans' health and behavior relate easily to studies of humans' stories expressed in fiction and nonfiction in English literature and other modern languages. Expressions of public health in literature provide a great opportunity for better understanding the roles that public health issues play today and have played in the past. Finding a member of an English or Spanish department who is interested in developing a course or joining a team-taught course related to public health will not be difficult.

Additional opportunities for collaboration abound. Environmental studies draw faculty throughout arts and sciences and public health is poised to do the same. Indeed, environmental studies programs encourage studying public health. Ecocriticism or green literary studies, postcolonial and cultural studies, and world or global studies throughout the humanities similarly prompt inquiry into public health. As philosophy and religion departments devote energy to applied ethics and law, public health is an attractive field for practice.

Potential Collaboration with Nursing Schools

The present and projected workforce shortage of nurses has prompted growth in the nation's 672 bachelor's degree schools and programs of nursing (8). Regional universities and comprehensive colleges often prepare professional nurses. Potential for collaboration

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between nursing schools and arts and sciences is considerable at varying types of institutions. Bachelor's degree nurses are required to study and practice public health toward community application; therefore, nursing faculty can provide expertise essential to program development for the minor that would be open to both nursing and nonnursing majors. Nursing faculty often hold community health nursing graduate degrees.

Community nursing education, required for bachelor's degrees in nursing, is founded on population-based public health. All accredited undergraduate bachelor's degree nursing programs require training in community health, including public health principles and structure, health promotion and disease prevention, epidemiology, population-based health assessment and care delivery, health disparities, and morbidity and mortality. Although nursing students might be unable to fit a public health minor into the undergraduate degree program, they might increase the number of students who enroll in the foundational courses of Epidemiology 101 and Public Health 101. Creative programming, using general education or arts and sciences courses—where Epidemiology 101 fulfills a life science requirement and Public Health 101 a social science requirement—might enable nursing students to complete the minor.

Potential Collaboration with Health Science Schools

Consensus Conference participants agreed that the array of health science schools and programs, the majority of which are located within comprehensive institutions, offer both faculty expertise for minor program development and potential demand from students. No health science bachelor's degree program exists that cannot be enhanced by a public health minor. Likewise, no health science curriculum exists that cannot enrich an interdisciplinary public health minor through shared or cross-listed courses and faculty expertise. Environmental health degree programs are an excellent case in point. These programs study the complex interplay of environment and human health and take a systemic approach to health interventions through environmental modification and control (9)

In addition, a public health minor might be attractive to pharmacy students. The doctorate of pharmacy degree requires no separate bachelor's degree and thus combines undergraduate arts and sciences education with professional study. A public health minor can be a valuable complement and enable students to meet general education requirements. Other undergraduate health science majors (e.g., occupational therapy, kinesiology or exercise science, speech or language pathology, and audiology) are also likely to take interest in a public health minor.

Potential Collaboration with 2-Year Colleges

Two-year institutions or community colleges have tremendous potential to cultivate student interest in public health and to provide foundation courses as requirements for the associate's degree and for dual-admission and transfer to 4-year (i.e., bachelor's degree) institutions. A comprehensive strategy to support development of public health minor

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programs can extend opportunities and provide models for partnership between 2- and 4-year schools that serve a substantial population of students in the United States.

Especially promising is a shared curricular development for Public Health 101 and Epidemiology 101 between 2-year colleges and the 4-year universities in which associate's degree holders are likely to complete their bachelor's degrees. Innovative public health teaching fellowships for graduate students can be created at nearby community colleges. A population-based approach to public health program development supports an emphasis on community colleges and the regional comprehensive universities that receive the majority of their 2-year graduates.

Foundational or Core Learning

Whatever the institutional model, participants at the Consensus Conference reached broad agreement on the foundation or core. A minor program might require two to four foundation courses. Public Health 101 and Epidemiology 101 should be included in the core, without exception. Different approaches might be taken in locating these two courses within the curriculum. Institutions might combine Epidemiology 101 and Public Health 101 for first- or second-year students and require an upper-division epidemiology course for the minor which also requires a biostatistics prerequisite. An introductory global health course might also be included in the core. The number and titles of courses will matter less in the end than the integrity of the learning goals of public health for an educated citizenry, which institutions can address in their own distinctive ways.

Minor programs should extend and develop foundational learning beyond Public Health 101 and Epidemiology 101, building on institutional strengths, and should include experiential learning such as service learning and/or a capstone experience. The conferees recommend the following outcomes be introduced and connected to the foundation of Public Health 101 and Epidemiology 101 throughout the courses offered for a minor:

- understanding of health promotion and disease prevention;
- foundational understanding of ethics and human rights, both theoretical and applied to real-world problems (e.g., disaster preparedness and biologic or chemical terrorism);
- basic understanding of statistics or biostatistics;
- understanding of global and international health, environmental health, and contemporary health topics (e.g., disparities in health care among populations, on the basis of sex, race, age, disability and ethnicity) (“public health is inherently global” a working group member commented).
- understanding of population science with an emphasis on population health and health literacy;
- experiential learning such as service-learning;
- understanding of collective action and methods of working toward community change; and

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- capstone learning through service and application, an integrative capstone experience, perhaps based on case study or culmination of the work of a learning community.

On this foundation and toward the capstone experience, minor programs can build different structures or be shaped by different interdisciplinary emphases. Designs will depend on institutional mission and strengths. Assuming Epidemiology 101 and Public Health 101 are required, the working group understands that advanced courses might share selected learning objectives (e.g., to use public health concepts to examine a local health problem or to understand disease determinants and causation) but seek performance at a higher level. Elective courses might accomplish a wide array of objectives such as:

- encourage work in applied science;
- open health career avenues for arts and science students in public health, environmental health, health communication, and the full range of professional programs;
- invite new and diverse student populations into the sciences;
- foster study, community-based work, and methods for achieving change in health policy, politics, and legislation (“The community is a living laboratory,” a conference participant commented);
- foster understanding of cultural difference, in both a U.S. and world context (“Cultivate cultural understanding and humility,” one program leader observed);
- teach behavior change strategies (individual and community-based);
- require both qualitative and quantitative analysis;
- open study of small- and large-group communication;
- open connections to diverse fields by using a population or societal approach (e.g., nutrition, sociology, psychology, anthropology, economics, political science, organizational studies, or human physiology);
- bring study of law, ethics, human rights, public policy, and social responsibility into action;
- connect theology, ethics, and medicine;
- promote advanced language study;
- open the field of health communication within communication, media, or digital studies;
- connect the study of drugs and alcohol, nutrition and health, and sexuality to population-based study; and
- teach information management and analysis (e.g., learning to use such tools as statistical software and to work with human-subject and confidentiality concerns).

The overall design of a minor should be distinctive and shaped by a mission-based commitment, as in the case of the University of Virginia’s minor in global public health. An institution with advanced community-outreach programs might choose to build service and community-based research into the options or electives. A minor intended to serve premedical and preallied health students might emphasize preprofessional

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education. Schools with strong communication programs might emphasize health communication. Planners should consider the academic culture of the institution as they begin discussing structure.

Conclusion

The promise of academic minor programs in public health is extraordinary. Such programs integrate well with arts and sciences and other major programs, bringing critical global matters into multiple disciplines. Opportunities for collaboration between units, especially bridging arts and sciences and professional schools, are enriching to institutions in countless ways. Professional school faculty might find the experience of teaching engaged undergraduates to be refreshing and inspiring. Arts and sciences faculty might discover a startling new perspective on their research and scholarship when they observe the world through a population perspective.

The population perspective of public health supports new approaches or new lenses through which to view both liberal arts and professional school majors. The emphasis on application and real-world problem solving enhances arts and sciences education, both general education and major areas of study. Public health minors invite students to take socially responsible steps and to provide valuable direction for career choices. Considering the magnitude of world health problems and the diversity of societies and cultures, we believe public health minors help students to focus on solutions, to be sensitive to differences and aware of vulnerable populations, and to be optimistic about world affairs. Through such programs, colleges and universities address critical needs for an educated citizenry and foster leadership development.

Although administrative challenges are substantive, as in any interdisciplinary or interschool project, committed stakeholders will find solutions, and the outcomes will fully reward the effort. For undergraduates who will live through much of the 21st century, these are engaging and relevant programs that will conduce to the good of the world.

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Part VII. Student Assessment

By Mark Kaelin Ed.D.

As we design our new courses, thinking about how we will determine what our students understand, assessment, may be the last thing on our minds. We can always write the traditional and student-expected midterm, final exam, and a term paper or other project into our syllabus later. When it comes to actually creating the exams, we can always review our previous exams (at least after we have taught the course the first time), our notes, and / or PowerPoint slides and, looking for content about which it is easy to write questions, cobble something together during the week, if not the night before. And when it comes to creating a term paper assignment, we can always find something we have assigned in our other classes and twist and tweak it so it is applicable to global health, public health, or epidemiology.

Why bother concerning ourselves with assessment now while we are still creating our new courses? Because our content areas' enduring understandings and how we will assess the degree to which our students have developed those understandings are the design specifications for deciding what we will do during our courses. If we are going to design our courses backward, as suggested by Grant Wiggins and Jay McTighe of *Understanding by Design*, (1998, p. 98), assessment is the second stage of the three stage backward design process. After, or as we complete the first stage, identifying our content area's enduring understandings, in stage two, we "think like assessors" and determine "... what acceptable evidence of that understanding would look like." And we do this "up front" (1998, p.12), now, as we are designing our courses, not the week before the course begins or the exam is scheduled.

What Is Assessment?

The Teaching Effectiveness Program, at the University of Oregon, defines assessment as "... the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences; the process culminates when assessment results are used to improve subsequent learning." (<http://tep.uoregon.edu/workshops/teachertraining/learnercentered/assessing/definition.html>)

Note that there are two aspects to assessment; to assess our students' understandings and to assess our ability to create experiences that develop those understandings. Thomas Angelo and Patricia Cross, (1993) of *Classroom Assessment Techniques: A Handbook for College Teachers*, state that "... there is no such thing as effective teaching in the absence

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of learning. Teaching without learning is just talking.” Assessment is about learning; whether we can create it and whether our students’ have developed it (p. 3).

Wiggins and McTighe remind us:

Understanding is not directly observable or measurable. How then can teachers obtain evidence of student understanding? They need to consider ways in which students might demonstrate their understanding through tangible performances, (1999, p. 133).

Assessment can be both formative (to improve the quality of student learning) and summative (to provide evidence for evaluating or grading students.) Angelo and Cross, (1993), stressing the value formative assessment, provide detailed descriptions of 50 formative classroom assessment techniques that can provide “... a continuous flow of accurate information on student learning.”

Wiggins and McTighe suggest that we think of assessments along a continuum of tangible performances, ranging from the informal to formal, beginning with “informal checks for understanding” and continuing through “observations and dialogues,” “quizzes and tests,” and “academic prompts,” to “performance tasks / projects,” (1998, p.12). Using combinations of these techniques during our courses provides us with a collection of evidence over time as opposed to a single piece of evidence that results from a mid-term or final exam. Given this *Curriculum Guide’s* emphasis on our content areas’ enduring understandings, the remaining portion of this section of the *Guide* will focus on a particular form of “performance tasks / projects” - the authentic assessment.

Authentic Assessment

One way to make our students’ enduring understandings observable is to create assessments that require them to answer a question for which the enduring understanding is the answer in an authentic context; the “ordinary practices of a culture” (J. S. Brown and colleague, 1989, p. 34).

The National Research Council advises:

Given that the goals of curriculum and assessment ... are to promote deep understanding of the underlying concepts and unifying themes of a discipline, effective assessment should reveal whether students truly understand those principles and can apply their knowledge in new situations. The ability to apply a domain principle to an unfamiliar problem, to combine ideas that originally were learned separately, and to use knowledge to construct new products is evidence that robust understanding has been achieved,” (2002, p. 146).

Producing such evidence, what Wiggins and McTighe call authentic assessments, prompt our students to see past the surface features of a problem to deeper, more fundamental

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principles; our content area’s enduring understandings. This requires our students to transfer what has been learned during our classes, apply it in another context in the authentic assessment, and develop their “... capacity to adapt knowledge, skills, and responsibilities to new settings and questions” after they leave our classrooms. (*Liberal Education and America’s Promise, 2007*) Authentic assessments require students to do more than *recall* specific knowledge and demonstrate specific skills. In addition, they require our students to *select*, from the knowledge and skills that they have developed, what knowledge and skills are needed to answer the question in a particular set of circumstances.

Bain observes that the best college teachers:

... create what we might call a natural critical learning environment in which they imbed the skills and information they wish to teach in assignments (questions and tasks) students will find fascinating – authentic tasks that will arouse curiosity, challenge students to rethink their assumptions and examine their mental models of reality. They create a safe environment in which students can try, come up short, receive feedback, and try again. Students understand and remember what they have learned because they master and use the reasoning abilities necessary to integrate it with large concepts. They become aware of the implications and applications of the ideas and information. (*2004, p. 47*)

Note that it is when we design authentic assessments that require our students to “use the reasoning abilities” of global health, public health, and epidemiology that our courses align with *The Essential Learning Outcomes* identified by the Association of American Colleges and Universities for liberal arts courses preparing students “... for life and careers in a rapidly changing and globalizing world.” (*Liberal Education and America’s Promise, 2007*).

Let us consider what an authentic assessment might look like for the enduring epidemiological understanding that was used as an example earlier:

In a population of people, health and disease are not distributed haphazardly. There are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

What question might we ask, in what set of circumstances, which would make the degree to which our students have developed this understanding observable and measurable?

Below is Draft 1 of a proposed authentic assessment—something at which to shoot.

Authentic Assessment of Enduring Understanding:

In a population of people, health and disease are not distributed haphazardly. There

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are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

After the fall semester's second, and much publicized, binge drinking incident resulting in a student at your college being hospitalized, your college president has asked you, as chair of the Student Government Association's Health Committee, to devise a plan that would allow you to accurately gather data so that you can describe the scope and nature of binge drinking among your college's student population.

The president wants a written copy of your plan on her desk in two weeks and, after consultation with her, wants you to present your plan to the Board of Trustees at their meeting in three weeks.

Applying the knowledge and skills developed during class, write a five page plan and prepare a ten minute presentation.

Be sure your plan and presentation includes:

1. Identification of the components of your plan and an explanation for why each component was included
2. Critique of your plan and the data it will generate
3. Explanation of how the data generated by your plan can be interpreted and what can and cannot be concluded under the circumstances
4. Description of how you anticipate important stakeholders will view your plan and the data it will generate

Keep in mind that our goal is to make our students' grasp of the enduring epidemiological understanding observable or measurable.

In a population of people, health and disease are not distributed haphazardly. There are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

According to Wiggins and McTighe, (1999) authentic assessments have the following characteristics: (p.140)

- Are realistic; simulate the context in which a person would be tested in the real world
- Require judgment and innovation to address an unstructured problem, rather than following a set routine
- Ask students to "do" the subject rather than simply recall what was taught
- Are messy and murky
- Require a repertoire of knowledge and skill to be used efficiently and effectively

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- Allow opportunities for rehearsal, practice, consultation, feedback, and refinement

Is this an authentic assessment? Critique Draft 1 in light of the characteristics of authentic assessments identified above. Is it realistic? Does it simulate the way a well-positioned college student might be asked to use his / her epidemiologic reasoning abilities to collect data about a sensitive health-related matter on a real college campus? Does it require judgment and innovation to address an unstructured, messy, and murky problem, rather than following a set routine? Does it ask students to “do” the subject, to think epidemiologically, rather than simply recall what was taught? Does it ask students, when confronted with two incidents of a health-related event, in this case binge drinking, to “back up” and view those incidents in the context of a population? Does it require a repertoire of knowledge and skill to be used efficiently and effectively? Would requiring weekly drafts of the plan create opportunities for rehearsal, practice, consultation, feedback, and refinement?

How can this assessment be improved?

Will our students find an epidemiological exploration of binge drinking *fascinating*? Will it arouse their *curiosity*? Would our students find unprotected sex, drug use, campus shooting, or other health-related events or behaviors more import and / or engaging?

Are there products other than a plan and a presentation that might make our students’ development of the enduring understanding more observable or measurable? A position paper, newspaper editorial, or debate?

Are there more realistic roles for our students than a member of the Student Government Association’s Health Committee? The president of a fraternity or sorority, a volunteer, campus “first-responder,” or an epidemiologist from the local health department?

Note that, to complete this assessment, our students need to demonstrate their knowledge of case definitions, calculating rates, the importance of identifying an appropriate denominator, incidence and prevalence, descriptive epidemiology, surveillance, and existing surveillance systems. But this knowledge goes beyond “the rote learning that produces formulaic answers and surface-level knowledge” about which Wiggins and McTighe warn, and requires our students “to use the reasoning abilities” subsumed in the enduring understanding, (1998, p.27).

Rehearsal, Practice, Consultation, Feedback, and Refinement

Note that the last of Wiggins and McTighe’s characteristics of authentic assessments, allow opportunities for rehearsal, practice, consultation, feedback, and refinement, is less about the actual assessment and more about how we operationalize it in our classes. Authentic assessments are time consuming for us to create, operationalize, and evaluate and for our students to complete and therefore should be used only to make our content areas’ enduring understandings, its big, important ideas, observable or measurable.

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Just as the photographer spends hours editing photographs in order to make them “pop,” well conceived authentic assessments can make our students’ understandings pop. In addition, they also can make our students’ misunderstandings, misconceptions, and need for clarity and context observable and, in doing so, “create opportunities for rehearsal, practice, consultation, feedback, and refinement.” In addition, they can give us insight into whether the experiences we are crafting for our students are achieving their intended goal.

Imagine having an authentic assessment for each of our content areas’ enduring understandings. Assessments that fascinate our students, arouse their curiosity, and make their understandings “pop.”

Stage 3 – Finally, what are *we* are going to do in class?

Answering the question, What are *we* are going to do in class?, is the third and last stage of the "backward design" process. Having identified the enduring understandings in our content areas (Stage 1) and what our students’ evidence of those understandings will be (Stage 2), we are now ready to decide what *we* will do in class. We can consider the enduring understandings and the evidence of those understandings as a rubric for deciding what we will do and, by extension, what we will not do during our courses. We only will do what will enable our students to develop the enduring understandings and create evidence of such. We will be enablers.

Wiggins and McTighe (1998) advise that “To be fully understood, it (an enduring understanding) will have to be explored, questioned, played with, used in realistic contexts, rephrased, and verified as important in some way,” (p. 114) or what they refer to as “meaning making work,” (p.105).

Having identified our content area’s enduring understandings and what we will accept as evidence of those understandings, we are ready to create enabling, “meaning making work” experiences for our students. We are prepared to identify for our students, at any time during our course, where they are (enduring understanding), where they are going, why it is important, what they will be expected to do, and what criteria will be used to evaluate what they do. We have identified the provocative thoughts, experiences, and perspectives that will capture our students’ attention. We are ready to equip our students with the knowledge, skills, and ways of thinking that will enable them to create evidence of their understandings. We set aside time for our students to reflect, rethink, and revise their work based on our feedback.

In doing so, we will be on our way to joining Bain’s (2004) “best college teachers;” teachers who “... plan their courses backward, deciding what students should be able to do by the end of the semester, they map a series of intellectual developments through the course, with the goal of encouraging students to learn on their own, engaging them in deep thinking,” (p. 114).

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Part VIII. Administrative Issues

By Susan Albertine Ph.D.

Because institutions differ so widely in structure and mission, no one set of answers is feasible for all administrative problems. However, the following is designed to present a wide-ranging set of questions that should be answered during the planning and implementation phases of a new program in public health, including an undergraduate minor in public health.

All Institutions

- Successful programs require investment and commitment from the administration and grassroots interest of faculty because they share an understanding of the institutional mission, the vision for the public health program, and in particular, the goal of an educated citizenry. Not only is this goal socially valuable, but it also helps to refocus and recenter discussion if disputes arise regarding program or course oversight.
- Effective programs negotiate across boundaries of departments and schools. An administrative entrepreneur at the center of the institution (in the office of academic affairs) can help.
- Successful programs need a champion who invests in sustained leadership.
- Certain administrative planning concerns are predictable and will vary with institutional type. Effective planning begins with mission and vision and then calculates the costs of program development and implementation, as well as the regular operating budget of a sustainable program. Answering the following questions is essential:
 - Who is releasing faculty to plan and run the new program?
 - How much can and should planners achieve before negotiating for additional resources?
 - Who leads the program?
 - Where is the faculty director's line?
 - Interdisciplinary or interschool programs cost time and money. In institutions without formula funding, how do planners find or negotiate for start-up costs?
 - Under formula funding, who pays?
 - Where does tuition flow within the institution?
 - Does the institution permit or encourage leadership to be shared or rotated among departments, especially in the case of interdisciplinary programs?
 - How does the institution handle the costs of team-teaching? Will it permit team-teaching at full faculty credit or weighting during a set period of program development (perhaps two semesters)?
- Common program management issues include the following:
 - Who advises students? How does the institution assign, credit, and share advising for other interdisciplinary or interschool programs?
 - Who pays attention to course sequencing in interdisciplinary programs?
 - How does the institution list interdisciplinary courses in program material and in student records?

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- What models for interdisciplinary programs (e.g., women's and gender studies) exist at the institution? How does the institution support departments that host other programs?
- Is having a departmental base or a hosting department necessary for an interdisciplinary program or can the program survive by floating?
 - Successful programs will require full integration with and within the arts and sciences unit. A thriving public health program will be built on respect for difference of perspective between professional schools and arts and sciences, and between the sciences, social sciences, and humanities. Stakeholders involved in planning might well consider the preferred level of preparation they want to seek for students and the long-term goals of the minor in institutional context.
- How do planners achieve full immersion in arts and sciences, with the goal of an educated citizenry firmly before all stakeholders?
- Do the goals of the minor serve a population beyond the premedical and other health professions students?
- Do the goals of the program invite students in the humanities to enroll and faculty in the humanities to address public health in disciplinary context?
- Do the goals of the program address the institutional commitment to general and liberal education?

Schools and Colleges with Health Science Units

- Programs might be easier to develop if the arts and sciences unit has access to a health science unit. Deliberate crossover between schools can be productive. Questions to anticipate include the following:
 - How to handle calendar and scheduling differences between schools, especially in universities with health science campuses?
 - Should undergraduates enroll in graduate courses in epidemiology or public health?
 - How will students enrolled in a program be granted access to upper-division and graduate courses?
 - If undergraduates take graduate public health and/or epidemiology, should the course be less heavily quantitative for the undergraduates (e.g., a separate set of assignments)? One program might determine that undergraduates perform well in graduate courses. Another program might worry that the rigor of the courses will decline if undergraduates enroll.
 - Should epidemiology and public health courses be located or administratively housed in the arts and sciences unit?
 - Oversight concerns might arise if the arts and sciences unit creates a major that competes with other degree programs. Minors are typically safer territory.
 - Public health minors should at least have an anchor in arts and sciences, especially the social sciences. Institutions should consider the advantages of a 5-year bachelor's or a combined bachelor's and masters of public health degree design.

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Schools and Colleges Without Health Science Units

- Arts and sciences units and liberal arts colleges without access to a health science unit should seek external resources, including the following:
 - Internet based courses;
 - community-based health professionals, using the business school model, e.g. an adjunct faculty epidemiologists from a public health department;
 - consortia with local health care institutions; and
 - support from and collaboration with health related nonprofit organizations or foundations.
- Planners need to answer the question: “Does the success of a program depend on the participation of faculty who have public health degrees?” Differences of opinion exist. Some nurses have masters or doctor of public health degrees and all nurses with BSNs and beyond have studied community health and can work as team members with arts and sciences faculty. Certain social science and science faculty have or are willing to earn master's degrees in public health, especially because many online programs are available. Certain institutions might need to hire adjunct faculty with public health degrees for team-teaching, program advisory, and curricular development. Concerns about the role of adjunct faculty are more readily addressed if the adjunct faculty take assignments that require and reward their professional expertise and that allow them to work in full partnership and standing with full-time faculty.

VIII. Resources for Implementation

The Curriculum Guide is being developed through the collaboration of the Association for Prevention Teaching and Research (APTR), the Association of American Colleges and Universities (AAC&U) and the Council of Colleges of Arts and Sciences (CCAS). The project is being funded by the Centers for Disease Control and Prevention (CDC) as part of the APTR-CDC Cooperative Agreement. Resources are available on all of their web sites at:

APTR: www.teachpublichealth.org

AAC&U: www.aacu.org

CCAS: www.ccas.net

Readers of this Curriculum Guide are strongly encouraged to provide feedback on the existing materials and suggest additional materials. Electronic feedback forms are available at the above sites.

The “essential findings” of the Consensus Conference on Undergraduate Public Health Education are being published in the CDC’s Morbidity and Mortality Weekly Report on October 19, 2007. They are available at www.cdc.gov/mmwr. The full report of the Consensus Conference are available through the Council of Colleges of Arts and Sciences at www.ccas.net under publications.

Many of the specific educational materials referred to in this curriculum guide are available at www.teachpublichealth.org. This web site and the accompanying Prevention Educational Resource Center (PERC) www.teachprevention.org are designed to be the site on the web for all faculty with interest in undergraduate public health.

Teachpublichealth.org includes information on:

- Upcoming educational opportunities for undergraduate public health
- The Undergraduate Public Health Interest Group being organized by APTR and open to all those interested in undergraduate public health
- List serve- information and sign up form for undergraduate public health list serve

Teachpublichealth.org also includes a Resources section providing selected materials designed to implement specific components of the curriculum frameworks recommended in this Guide. In addition to the YES materials outlines in the Epidemiology Laboratory section this Resources section includes an interactive overview of the Population Health Approach using cigarette smoking and extensive web-links to outline the four components of evidence-based public health i.e. problem, causation, intervention, implementation. Go to www.teachpublichealth.org and look under Resources.

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The Prevention Education Resource Center (PERC) is being developed to provide a searchable site that will include undergraduate public health education materials. This site will offer an option for peer review of materials, users' reviews, and will encourage educators to submit a wide range of materials including sample syllabi, reading lists, student assessment materials as well as curricula for both core and advanced levels.

Sample syllabi for core undergraduate public health courses are already available at www.teachprevention.org (under Hot Topics). All those who teach undergraduate public health are encouraged to submit their materials and allow them to be shared by others.

Appendix A

How Will We Prepare to Teach Our 101 Course? “Backward Design”

Mark W. Kaelin EdD

Teachers are designers of learning experiences. Given the challenge of designing a course addressing subject matter about which we have had no formal education, we might begin by asking ourselves what *we*, as the teachers, are going to do in our classes for three hours each week for fifteen weeks! With what will we fill those forty-five hours? We might gather textbooks and, paying particular attention to the tables of contents, begin to craft a course outline. We might recall some of our favorite lessons and think about how we can make them relevant to our new subject matter. We might Google and network to find out what others who teach our subject matter have done. We might start to create a collection of assigned readings – a textbook, some historical documents, a few dramatic case studies, and current newspaper columns. And, for a change of pace, we might think of a video and a guest speaker or two. In short, we might begin to plan our courses by thinking about what *we* will do and plan our courses as a series of teacher-centered activities that cover an array of topics in our content areas.

However, the National Research Council (NRC), (2002, p. 119 and 137) warns that “Curricula that emphasize breadth of coverage and simple recall of facts may hinder students’ abilities to organize knowledge effectively because they do not learn anything in depth, and thus are not able to structure what they are learning around the major organizing principles and core concepts of the discipline.” How can we design our courses around major organizing principles and core concepts of our new content areas?

Grant Wiggins and Jay McTighe, the authors of *Understanding by Design* (1998, p. 98), suggest that answering the question, What are *we* going to do in class?, is the last stage in a three stage process they call “backward design.” The authors suggest that we begin by identifying, not what *we* will do, but, by first identifying what we want our students to understand, then by determining what acceptable evidence of that understanding would look like, and then, and only then, by deciding what *we* will do. The three stages of the “backward design” process will serve as the framework for this section of the *Curriculum Guide*.

Stage 1: Identify Desired Results

If we our going to design our courses “backward,” the first step is to identify the major organizing principles and core concepts of our content area, or what Wiggins and McTighe call “enduring understandings,” that we want our students to have grasped at the conclusion of our courses.

One of the NRC’s (2002, p.119) *Seven Principles of Learning* is, “Learning with understanding is facilitated when new and existing knowledge is structured around the major concepts and principles of a discipline.” By identifying the enduring

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understandings of our content areas, we will be creating a framework to structure both our newly developing knowledge as well as that of our students.

How might we identify the enduring understandings in our content areas? Wiggins and McTighe (1999, p. 78) suggest the following “filters” through which subject matter must pass to be considered an enduring understanding. An enduring understanding must:

- Represent a big idea having lasting value outside the classroom
- Reside at the heart of the discipline and involve “doing” the subject
- Require the uncovering of abstract or misunderstood ideas

As an example, consider the following as a possible enduring understanding for a general education Epidemiology 101 course:

In a population of people, health and disease are not distributed haphazardly. There are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

Does this understanding pass through the above filters? Is this an enduring understanding? Does the development of this understanding arm students for years to come with knowledge empowering them to comprehend, not only the world they presently live, but, the world in which they *will* live outside the classroom? Is this understanding a cornerstone of epidemiology? Does this understanding introduce the student to the power of population thinking; the idea that when confronted with a single instance of a disease, one can learn about that disease by “backing up” and viewing that single case in the context of a population that includes people with and without the illness? When students think in this manner, are they thinking like epidemiologists? Although not initially apparent, when students develop this understanding, will they uncover abstract and misunderstood ideas; the value of a precise case definition, ways of numerically expressing the number of cases, the challenge of identifying an appropriate denominator, the need to adjust rates, the mechanisms used in existing surveillance systems, and the ways disease patterns can be described in terms of person, place, and time?

While experts in a content area have an enormous knowledge base, it is not simply a list of facts and formulas. Experts’ knowledge is organized around their discipline’s important concepts and principles; its big ideas; its enduring understandings, (NRC, 2002, p. 135). Having this organizational structure empowers the expert to view a particular problem as a “for instance” of an underlying concept or principle and identify similarities with other “for instances.” Experts’ “... knowledge is connected and organized, and it is ‘conditionalized’ to specify the context in which it is applicable” (NRC, 2002, p. 119).

In the content areas of global health, public health, and epidemiology, there is little question that, whatever “specific instance” or “specific thing” we choose to focus on to

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develop our enduring understandings, our students will encounter “other things like it.” Review the above enduring epidemiologic understanding with HIV/AIDS as the “specific instance.” Would that same big idea provide students with “a model for understanding other things like it” - SARS, West-Nile virus, carpal tunnel syndrome, Gulf War Syndrome, or whatever tomorrow’s headlines bring to our and our students’ attention? By designing our courses around the enduring understandings of our content areas, we will empower our students to understand not just today’s instances but tomorrow’s; “to see past the surface features of any problem to the deeper, more fundamental principles of the discipline” (NRC, 2002, p. 119).

We should keep in mind, however, that if we are going to focus on the enduring understandings in our subject areas, we will need to make choices. In any of the three content areas, global health, public health, or epidemiology, there is more content than we can thoughtfully address in any one course and, in light of our subject area’s enduring understandings, all of that content is not of equal value. As one of the outstanding college teachers identified by Ken Bain, author of *What the Best College Teachers Do*, (2004, p. 30) reflects, “I have to think about why anyone would want to remember particular pieces of information. What does this fact help you understand? What problems does it help you address?”

Stage II: Determine Acceptable Evidence

After identifying our enduring understandings, we now think like assessors and identify what we would consider acceptable evidence that our students have developed those understandings.

To begin this process, Wiggins and McTighe (1998, p. 33) propose identifying the “essential questions” for each of our enduring understandings. Essential questions are the questions that, when originally answered, gave rise to our enduring understandings. At some point in time, the enduring understandings in our content areas did not exist. Often textbooks merely present the current state of knowledge in our content areas as if it were a given and so to students reading a textbook, it can appear that the knowledge in our content areas came into existence at the same point in time rather than accumulate over centuries. Students need to appreciate that today’s enduring understandings are the “... answers to someone’s prior questions, produced and refined in response to puzzles, inquiry, testing, argument, and revision.”

How do we identify the essential questions for the enduring understandings in our content area? (Wiggins and McTighe, 2004 p. 81) Essential questions have the following characteristic:

- Have no obvious right answer
- Raise other important questions, often across subject-area boundaries
- Address philosophical or conceptual foundations of a discipline
- Recur naturally

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Again, consider the enduring understanding previously used as an example:

In a population of people, health and disease are not distributed haphazardly. There are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

What are the questions that people might have had from which the above enduring understanding grew? What are the questions for which this enduring understanding came to be the answer?

- Is anyone else sick?
- Are there differences between the sick people and healthy people?
- Is the sickness distributed haphazardly or is there a pattern?
- What would a pattern look like?
- If there is a pattern to the distribution of the sickness, what parameters could be used to describe it?
- Does everyone get sick, in every place, all of the time? Or do some people get sick, in some places, at some times? Who are those people? Where are those places? When are those times?
- How can information about the sick and healthy people be collected so that, if a pattern exists, it can be identified?
- If there is a pattern, if it is staring us in the face, will we see it?

Do these questions have no obvious right answers? Do they raise other important questions from other content areas? Do they address fundamental concepts from the content area? Will they recur naturally?

Bain (2004, p. 36) observed that, when the best college teachers meet their students on the first day of class, “Rather than laying out a set of requirements for students, they usually talk about the promises of the course, about the kinds of questions the discipline will help students answer, or about the intellectual, emotional, or physical abilities that it will help them develop.”

Based on our content area’s enduring understandings and their essential questions, we now begin to think as assessors. Because our students’ understandings are not directly observable or measurable, we need to ask ourselves how we can obtain evidence of their understandings. How can we put our students in a set of circumstances in which they demonstrate their understandings through tangible performances? (1999, p. 133)

One way to make our students’ understandings observable is by creating assessments that require them to answer an iteration of an essential question or questions and to do so in an authentic context. Such assessments require students to do more than simply *recall* specific knowledge and demonstrate specific skills. In addition, they require students,

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just like people who work in the field, to *select* the knowledge and skills that will allow them to answer the question in a particular set of circumstances.

The NRC (2002, p. 137) points out, “If students are able to draw on their cultural, social, and historical experiences in problem-solving situations, they are more likely to deepen their understanding. This can be accomplished by design through structured activities that, in real or simulated fashion, allow students to experience problem solving and inquiry in situations drawn from their personal experiences.”

Wiggins and McTighe (1999, p. 140) explain that authentic assessments have the following characteristics:

- Are realistic; simulate the way a person’s understanding is tested in the real world
- Require judgment and innovation to address an unstructured problem, rather than following a set routine
- Ask students to “do” the subject rather than simply recall what was taught
- Replicate the context in which a person would be tested at work, in the community, or at home
- Are messy and murky
- Require a repertoire of knowledge and skill to be used efficiently and effectively
- Allow opportunities for rehearsal, practice, consultation, feedback, and refinement

Again, in light of the enduring understanding and the suggested essential questions identified above and consider whether or not the assessment below is authentic.

After the third binge drinking incident of the year at State University after which a student was hospitalized, the Student Government Association (SGA) has decided to investigate the problem. The president of the SGA has asked you to chair a working group that will develop a plan for answering the following questions:

- Are there differences between the binge drinkers, the drinkers, and the abstainers on campus?
- Is there a pattern to the binge drinking?
- If there is a pattern to the binge drinking, what parameters can be used to describe it?
- Who are the binge drinkers? Where do they binge? When do they binge?
- How can information about binge drinking on this campus be collected so that, if a pattern exists, it can be accurately identified?
- Are there mechanisms that already exist for collecting information from college students about other matters that can be adapted to collect information about binge drinking?
- Are there mechanisms that already exist for collecting information about binge drinking that can be adapted for use on this campus?

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- If there is a pattern to the binge drinking, if it is staring us in the face, will we see it?
- Will knowing the binge drinking pattern on campus help us address the problem?

The SGA president would like you to produce a plan for answering these questions in time for the next meeting in three weeks.

Is this an authentic assessment? Does it meet the criteria identified above? In completing the assessment is a student's understanding of the understanding below observable and measurable?

In a population of people, health and disease are not distributed haphazardly. There are patterns to their occurrences. These patterns can be identified through the surveillance of a population.

Is it realistic? Does it require judgment and innovation to address an unstructured problem, rather than following a set routine? Does it require students to "do" the subject, to think epidemiologically? Is the assessment messy and murky? Does it require students to simply *recall* specific knowledge and demonstrate specific skills or to *select* what knowledge and skills will allow them to answer questions in a particular set of circumstances? And finally, can it be orchestrated in a manner that will provide students with opportunities for rehearsal, practice, consultation, feedback, and refinement?

Note that, to complete this assessment, students need to know about case definitions, calculating rates, the importance identifying an appropriate denominator, incidence and prevalence, descriptive epidemiology, surveillance, and existing surveillance systems. It may not be based on the expert's rich body of content knowledge yet but it begins to "conditionalize" students' development of the "big idea," the enduring understanding.

The NRC (2002, p. 146) advises:

Given that the goals of curriculum and assessment ... are to promote deep understanding of the underlying concepts and unifying themes of a discipline, effective assessment should reveal whether students truly understand those principles and can apply their knowledge in new situations. The ability to apply a domain principle to an unfamiliar problem, to combine ideas that originally were learned separately, and to use knowledge to construct new products is evidence that robust understanding has been achieved."

Authentic assessments are one of a variety of ways that will allow us to make our students' understandings visible and measurable. But they are time consuming for us to create, facilitate, and evaluate and for our students to complete and therefore should be used only to "conditionalize" students' development of the enduring understandings in our content areas.

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Just as the photographer spends hours editing photographs in order to make them “pop,” well-conceived authentic assessments can make our students’ understandings pop. In addition, they also can make our students’ misunderstandings, misconceptions, and need for clarity and context observable and, in doing so, “create opportunities for rehearsal, practice, consultation, feedback, and refinement.” In addition, they can give us insight into whether the experiences we are crafting for our students are achieving their intended goal.

Stage III. Plan Learning Experiences and Instruction

Now we are ready to begin thinking about what *we* will do during those 3 hours of class time each week. And having identified the enduring understandings in our content areas that will provide a pedagogical framework for designing our courses and having created a collection of authentic assessments that will allow us to observe and measure our students’ grasp of those understandings, addressing this challenge should seem less intimidating and more manageable.

We can consider the enduring understandings and the evidence of those understandings as a rubric for deciding what we will do and, by extension, what we will *not* do during our classes. We only will do what will enable our students to develop the enduring understandings and create evidence of such. We will be enablers.

Wiggins and McTighe (1998, p. 114 and 105) suggest that enduring understandings are unlikely to be understood if merely taught and advise, “To be fully understood, it (an enduring understanding) will have to be explored, questioned, played with, used in realistic contexts, rephrased, and verified as important in some way” or what they refer to as “meaning making work” that will do one or more of the following:

1. Identify for students where they are, where they are going (the enduring understanding), why it is important, what they will be expected to do, and what criteria will be used to evaluate what they do.
2. Hook students with a provocative thought, experience, or perspective that will heighten their interest.
3. Enable and equip students with the knowledge, skills, and ways of thinking that are needed to create evidence of their understandings.
4. Provide students with opportunities for reflection, rethinking, and revising their work based on feedback.
5. Require students to self-assess their work in light of the purpose of the class and identify logical next steps to continue to develop the understanding.

This is what we will do during those 45 hours of class time. We will create these enabling experiences during which our students “kick the tires” of the big ideas in our content areas by exploring, questioning, playing with, rephrasing, and verifying them. In doing so, they will encounter the same understanding at work in multiple contexts and develop a deeper appreciation how it can be used and an ability to transfer what has been learned in one context to others (NRC, 2002, p. 128).

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Summary

None of us wants to intentionally design a course that our students will view as merely a collection of teacher-centered activities about bits of information in our content areas. By designing our curricula backward; by first identifying what we want our students to understand, by determining what acceptable evidence of those understandings would look like, and lastly by planning enabling instruction, we can guard against this outcome.

Let's return to those textbooks we gathered, those favorite lessons we experienced as students, that list of assigned readings, and those videos and guest speakers we identified. Do we discard those plans? Not necessarily. We apply our enduring understanding / authentic assessment rubric to these plans. And, given the lengths of our courses, we implement the parts of the plan that will enable our students to develop our discipline's enduring understandings and demonstrate that understanding in authentic circumstances.

One of the attributes of Ken Bain's (2004, p. 25) outstanding college teachers is that they "... reflect deeply on the nature of thinking within their fields" or what is called metacognition, thinking about thinking, and in doing so:

They can then use that ability to think about their own thinking ... to grasp how other people might learn. They know what has to come first, and they can distinguish between foundational concepts and elaborations or illustrations of those ideas. They realize where people are likely to face difficulties developing their own comprehension, and they can use that understanding to simplify and clarify complex topics for others, tell the right story, or raise a powerfully provocative question.

As we start to explore the subject matter in our new content areas, we can take advantage of this opportunity by thinking about our thinking. We can become aware of how we are learning and structuring our knowledge, by identifying what comes first before we really understand an important concept, by being cognizant of how a new concept "fits" into what we already know and by considering the possibility that our students might not yet have that knowledge.

Hopefully this approach to enduring understandings and backwards design turns our struggle to get our arms around new content areas into valuable experiences which can inform the courses we create, the ways we teach them, and, most importantly, the way our students learn.

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Appendix B

Key Concepts in Epidemiology and Evidence-Based Thinking **Richard K. Riegelman**

Epidemiology forms the scientific basis for evidence-based thinking which in turn provides the foundation for evidence-based public health, evidence-based medicine, and health care as well as a range of other evidence-based approaches that are increasingly being used in the social sciences including a range of public policy applications.

The following key concepts may be useful in understanding the epidemiological underpinnings of evidence-based thinking

Curriculum Framework for Epidemiology 101 **With Key Concepts**

I. History, Philosophy, and Uses of Epidemiology

1. Historical contributions of epidemiology and development of epidemiological thinking
2. Current uses of epidemiology
3. Ethics and philosophy of epidemiology

Key Concepts

Epidemic- The occurrence in a community or region of cases of an illness, specific health behavior, or other health related events clearly in excess of normal expectancy (Last). The concept of an epidemic is derived from the occurrence of epidemics of infectious disease but is not limited to infectious disease. The concept of community is not limited to geographic area and includes geographically dispersed communities connected by economics, communications, culture, religion, health care/ insurance and a variety of other mechanisms. The concept of “excess of normal expectancy”, may imply one or a small number of cases when none are expected or an increase from a lower rate. The concept of epidemic should be distinguished from endemic which is defined as the constant presence of a disease or infectious agent within a given geographic area or population group (Last). A pandemic implies an epidemic occurring worldwide, or over a

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very wide area (Last). Recognition of the presence of epidemics is often the starting point for epidemiologic investigations.

Etiology- Establishing etiology or causation is a fundamental aim of epidemiology. The concept of etiology or cause as used in epidemiology has been called contributory cause. Contributory cause implies that the following three conditions have been fulfilled
 1) Association at the individual level 2) The “cause” precedes in time the “effect” and 3) Altering the cause alters the effect. When definitive evidence of contributory cause is not present additional ancillary or supportive criteria may be used to make scientific judgments about cause and effect. Contributory cause does not require that the “cause” is either necessary or sufficient to produce the “effect”. Modern Koch’s Postulates (NIAID) provide a parallel framework for infectious diseases based upon demonstration of 1) epidemiological association 2) isolation and 3) transmission.

Efficacy- Efficacy is the extent to which a specific intervention ...produces a beneficial result under ideal conditions... Ideally the determination of efficacy is based upon the results of a randomized clinical trial (Last). Efficacy is established using the same three criteria as contributory cause. Randomized clinical trials are capable of establishing all three of these criteria for a specific population and thus well conducted randomized clinical trials are considered the gold standard for efficacy. The concept of intervention is an intentionally broad concept that includes preventive, curative and rehabilitative approaches. The concept of efficacy needs to be distinguished from effectiveness which is a measure of the extent to which a specific intervention...when deployed in the field in routine circumstances does what it is intended to do for a specified population. (Last) Efficacy often does not include the harms that occur as a result of an intervention. The concept of net efficacy or net benefit implies that the harms as well as the benefits have been taken into account.

Prediction- Epidemiological methods often collect past data to anticipate or predict future events. Prediction of the future based upon studying the past is difficult and often un dependable. Epidemiological methods examine past changes and attempt to distinguish artifactual from real changes as the basis for identifying trends. Projecting trends into the future, even when past trends are real, requires caution as well as consideration of known mechanisms that preclude straight line or linear prediction. These include the cohort effect, regression to the mean, and biological mechanisms such as herd immunity, as well as interventions that may alter the future rates.

Populations and samples- Epidemiological methods generally investigate selected subsets or small groups that reflect or represent a larger group known as a population. Statistical methods are used to draw inferences about the population from the results obtained in the investigation of the sample. Understanding the meaning of the results requires not only an appreciation of the statistical methods used but also of the characteristics that define the population as well as the methods used to obtain or “draw” the sample from the population. Inclusion and exclusion criteria are often used to define or delineate the population. The nature of the sampling methods need to be examined to

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determine whether the sample is reflective or representative of a population of interest which is often called the target population.

Informed consent- Voluntary consent given by an subject- i.e., person or a responsible proxy (e.g. a parent)- for participation in a study, immunizations program, treatment regimen etc. after being informed of the purpose, methods, procedures, benefits and risk, and, when relevant, the degree of uncertainty about outcome (Last). Informed consent may only be requested after a determination often by an Institutional Review Board (IRB) that a decision to participate is reasonable and that adequate effort have been made to carefully design the investigation, communicate necessary information for the informed consent process, and protect the confidentiality of the information. Ethical issues underlie many decisions on participation in research including informing participants of the right to discontinue the study at any time for any reason and the use of placebo controls only when they reflect the standard of practice.

II. Descriptive Epidemiology

1. Condition, Frequency and Severity
case definition and populations; incidence, prevalence, case-fatality
2. Data and Disease - vital statistics, surveillance and measures of health status
3. Generating hypotheses
Patterns of Disease - person, place, time; changes and difference in rates; exposure; incubation period; disease spread

Key Concepts

Person, Place and Time- A disease or condition is often described epidemiologically by identifying who (demographic and personal characteristics), where (geographic distribution) and when (timing including seasonal variation and incubation period) the disease or condition occurs. Data on person, place and time may be used to generate hypotheses about potential factors associated with the disease, help assess the need for services, and serve as the basis for identifying changes or differences in the frequency of occurrence of a disease or other conditions.

Rates- The term rate is often used in a generic sense as a measure of the frequency of occurrence of a phenomenon (Last). As a general term, rate incorporates several measures of the frequency of occurrence including counts, proportion, rate (true rate), and ratios. A count implies the number of cases that have occurred over a period of time. A proportion implies a ratio in which the numerator is a subset of the denominator e.g. prevalence, case-fatality. A true rate e.g. incidence rate and mortality rate implies not only that the numerator is a subset of the denominator but includes a unit of time e.g. per year, person-year. A ratio implies only that a numerator and a denominator exist and does not necessarily imply that the numerator is a subset of the denominator e.g. maternal mortality rate. Incidence rate, prevalence, and case-fatality together provide an epidemiological description of a disease or condition. The measurement of rates applies

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to both the descriptive studies and analytical studies. A descriptive study is concerned with and designed only to describe the existing distribution of variables without regard for causal or other hypotheses (Last). An analytical study is designed to examine associations, commonly putative or hypothesized causal relationships (Last). Analytical studies in this framework include ecological or population rate comparisons, cross-sectional, case-control, cohort, and randomized clinical trials.

Changes or difference in rates- Rates especially mortality rates and incidence rates are often investigated in order to establish trends, and generate hypotheses regarding causation. Real differences or changes in rates require a conclusion that artifactual factors do not explain the differences or changes. Possible artifactual factors include changes or differences in definition of the condition, interest in detecting the condition or ability to detect the condition. Real changes imply that artifactual factors have been ruled-out as likely explanations. Fair comparison of rates often require adjustment or standardization for age since age is the most common demographic factor associated with the development of disease. Real changes or differences may be due to a variety of factors and do not necessarily imply that the current trend will continue into the future. Difference and association are used to compare rates. Differences implies that one rate is subtracted from another and a difference of zero implies no difference. Association imply ratios in which one rates serves as the numerator and the other as the denominator. When ratios that measure association equal 1 the rates in the numerator and in the denominator are the same indicating no increase or decrease in the probability of disease or other outcome.

Surveillance- Public health surveillance is the collection, collation and analysis of data and the timely dissemination of the information (Last). The uses of public health surveillance span the full scope of epidemiology and public health from problem identification to establishing causation to recommendations for intervention to options for implementation. Specifically public health surveillance can be used for estimation of the magnitude of a problem; determination of geographic distribution; detection of epidemics; generation of hypotheses; evaluation of control measures; and monitoring changes in infectious disease, health practices, and use of health care procedures. Tradition public health surveillance relies on vital statistics including birth and death certificates as well as reporting of notifiable diseases predominantly but not exclusively infectious diseases. Currently multiple surveillance systems exist including passive and active systems. Active surveillance systems that utilize methods of data collection under the direct control of the surveillance system are generally more accurate, complete, timely but also more costly. Newer real time systems are being developed including syndromic surveillance that rely on patterns of presentation of symptoms as well as monitoring of indirect indicators such as over-the-counter sales of medications and school absenteeism. Case reports are less systematic than surveillance but may be useful in identifying new diseases and syndromes, the existence of known diseases in new populations, new presentations of a known disease, and diseases that do now respond as expected to treatment.

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Health status measures- Summary measures of the health of populations used to compare the health status of one population over a period of time or to compare two or more populations during the same period of time. Life-expectancy and infant mortality rates are the traditional measures designed to examine the impact of mortality. Under-5 mortality has become the standard measure of health in young children while health adjusted life-expectancy (HALEs) is becoming a frequently used measure of health status that incorporates measures of the quality of life as well as the quantity. None of these measures is designed to predict the future and is undependable when used to estimate life span in any one individual.

III. Association and Causation

1. Estimation - measures of the strength of the association, graphical display of data; risk, relative risk, attributable risk, population attributable risk (added)
2. Inference - concepts of statistical significance and confidence intervals
3. Bias and Confounding – information and selection; adjustment; effect modification
4. Causation – risk factors and other determinants of diseases and conditions
5. Efficacy of Interventions

Key Concepts

Estimation- Use of summary measurements to estimate or approximate the magnitude of the difference or association. Measures of association are most commonly used in epidemiology. Rate ratio implies that rates in two populations are being compared and does not imply that information on individuals is available. The term group association is used with this type of comparison of rates. Relative risk is a measure of the probability in the presence and absence of a particular factor. Relative risks of greater than one imply that the presence of the factor represented in the numerator increases the probability of occurrence of the condition. A relative risk of less than one implies that the presence of the factor represented in the numerator reduced the probability of occurrence of the condition. Odds ratio are ratios of odds and thus do not include the frequency of occurrence of the event in the denominators. When the rates of the disease are low the odds ratio can be used as an approximation of the relative risk. Attributable risk percentage can be derived from relative risk. It represent the percentage of the condition that is associated with the factor. Population attributable risk percentage requires not only the relative risk but also an estimate of the prevalence of the factor in the population of interest. Population attributable risk indicates the proportion of the condition that is associated with the factor in a population made up of individuals with and without the factor. The number-needed-to-treat is a relatively new measurement that is gaining acceptance by clinical health professions as an measure of the number of individuals that need to be treated to prevent one additional case of the disease or other outcome.

Inference- Inference implies drawing conclusions about a population based upon data from a sample of the population. Statistical significance testing is used to perform

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inference. Statistical significance tests produce a P-value which indicates the probability of obtaining the observed data in a sample (or even more extreme data) if the null hypothesis of no association (or difference) in the population is in fact true. Association implies that the relationship between two variable is statistically significant. Proper interpretation of statistical significance testing requires an understanding of the concepts of multiple comparison, Type 1 error, and Type 2 error. The 95% confidence interval indicates the range within which one can be 95% confident that the value e.g. relative risk lies in the population. Statistical significance can be derived from the 95% confidence intervals around the relative risk or odds ratio by determining whether the confidence interval crosses 1.

Confounding- A situation in which a measure of the effect of an exposure... is distorted because of the association of exposure with other factor(s) that influence the outcome under study (Last). Confounding implies that difference between those in the study and the control groups makes a difference in the outcome being measured. Confounding is established by determining that the confounding factor is associated with the potential “cause” as well as with the potential “effect”. Confounding may result from chance differences between the groups or from systematic differences or bias in the methods used to obtain the groups or measure the outcomes. Confounding is very common in human studies and may be addressed by a number of methods including use of inclusion and exclusion criteria, matching or pairing, randomization, and adjustment of the data after the data has been collected. Adjustment may utilized methods of stratification that separate the data into more that one group e.g. gender, severity of illness and examines the relationship in each strata. Regression methods allow simultaneous examination of multiple potential confounding variable but need to be carefully performed and interpreted.

Risk factor- An aspect of personal behavior or life-style, an environmental exposure, or an inborn or inherited characteristic, that, on the basis of epidemiological evidence, is known to be associated with the health-related condition(s) considered important to prevent. (Last). The term risk factor may or may not imply that the factor precedes the outcome. To highlight this distinction the term risk marker has been used when evidence is lacking that the factor precedes the outcome. A risk factor does not imply a cause and effect relationship.

Contributory cause- Contributory cause implies that a change in the “cause” increases or decreased the probability of occurrence of the “effect”. Definitive proof of contributory cause requires establishing three definitive criteria 1) association at the individual level 2) the “cause” precedes the “effect” and 3) altering the “cause” alters the “effect”. Ancillary or supportive criteria are often used in the absence of evidence of the definitive criteria. These criteria have been debated but include at least the following: strength of the relationship, dose-response relationship, consistency, and biological plausibility, Contributory cause needs to be distinguished from necessary and sufficient cause. Contributory causes such as cigarettes and lung cancer do not imply that cigarettes are either necessary nor sufficient for the development of lung cancer. Legal concept of

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causation and clinical criteria of cause of death differ from the epidemiological meaning of contributory cause.

Interaction- The interdependent operation of two or more causes to produce or prevent an effect (Last). When two or more risk factors are present their impacts are generally assumed to add together. However, instances of multiplicative interaction e.g. cigarettes and asbestos and hepatitis B and aflatoxin exposure are well documented. Occasionally one exposure may protect individuals from another. Effect modification is often used as a synonym for interaction but it specifically implies the impact of one factor is affected by the level of a second factor. Non additive interactions are quite common but statistical methods generally only recognize non-additive relationship when the interaction can be demonstrated to be statistically significant.

IV. Analytical Epidemiology

1. Ecologic/ Population Comparison- populations as the unit of analysis
2. Case-control and Cross-sectional
3. Cohort - prospective and retrospective
4. Experimental studies - randomized clinical trials and community trials

Key Concepts

Ecological Studies- A study in which the units of analysis are populations or groups of people rather than individuals. (Last). Ecological or population studies compare the rates of risk factors e.g. cigarettes, low density lipoprotein with rates of disease e.g. lung cancer or coronary artery disease without identifying whether or not particular individuals have been exposed to the risk factor. Ecological studies are prone to the ecological fallacy which implies that a relationship found when comparing populations may not apply to individuals e.g. the association found between a countries car ownership and the incidence of breast cancer, or the stork population and the birth rates. Associations that exist at the population level may be referred to as group associations to distinguish them from individual associations which is the first of three definitive criteria for establishing cause and effect. Ecological studies are often useful in generating hypotheses as the first step in investigating etiology. They may also be useful after establishing efficacy to examine effectiveness under the conditions in which the intervention is applied in practice.

Case-control- The observational epidemiological study of persons with the disease (or other outcome variable) of interest and a suitable control (comparison reference) group of persons without the disease (Last). Case-control studies produce odds ratio as their measure of the strength of association and may be used to establish the existence of an association at the individual level i.e. the first criteria of contributory cause. Case-control studies are prone to a variety of methodological problems and caution needs to be exercised when using case-control studies to establish that the “cause” precedes the

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“effect” because of the potential for reverse causality e.g. strokes produce hypertension . Despite the need for careful study design, case-control studies have a number of potential advantages include their small sample size requirements, their speed of execution, and their ability to examine a number of potential associations. Case-control studies have also been called retrospective studies.

Cohort study- Epidemiological study in which subsets of a defined population can be identified whohave been exposed or not exposed...to a factor or factors hypothesized to influence the probability of occurrence of a given disease or other outcome (Last). The unique feature of a cohort study is the identification of exposed study and unexposed control groups prior to obtaining or identifying data on the development of the disease or other outcome. Cohort studies have the potential to establish criteria #2 of contributory cause i.e. the “cause” precedes the “effect” as well as criteria #1 i.e. association at the individual level. Cohort studies may be initiated prior to the development of the disease and individuals may be followed forward in time to determine whether or not they develop the disease. This is called a concurrent or prospective cohort e.g. Framingham Study. Alternatively, an existing database may be used to first identify study and control groups based on their previous risk factor status. After identifying the groups the investigator can then immediately determine outcome based on the existing data in the database. These types of studies are called non-concurrent or retrospective cohorts. Retrospective cohort studies are subject to numerous practical, ethical, and logistical limitations but have the potential to produce rapid and inexpensive studies that establish the first two criteria of contributory cause. Due to their potentially large size they may also be used to assess the safety of interventions.

Randomized controlled trial- An epidemiologic experiment in which subjects in a population are randomly allocated into groups usually called study and control group to receive or not to receive an experimental preventive or therapeutic procedure, maneuver, or intervention. (Last) Randomization or random assignment is the essential characteristic and implies that a chance procedure has been utilized to assign individuals to study and control groups. Randomization may be conducted on an individual basis or groups or communities may be randomized to study and control groups. Masking or blinding is a desirable but not essential characteristic of a randomized clinical trial. Well designed randomized clinical trials are capable of establishing all three definitive criteria of contributory cause or efficacy and are therefore considered the gold standard for establishing efficacy. Randomized clinical trials have limited ability to establish safety since they are often too small, too short and too simple i.e. they usually do not include vulnerable or complex patients with multiple diseases and/or treatment. Randomized clinical trials often utilize narrowly defined inclusion and exclusion criteria which limit the ability to extrapolate or generalize their result to groups or populations not included in the randomized clinical trial. Ethical standards underlie many study design and implementation issues in randomized clinical trials.

V. Evidence-Based Public Health- Evidence-Based Recommendations

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1. Harms and Benefits - decision analysis and perceptions of risk and benefits
2. Cost-effectiveness

Key Concepts

Evidence-based recommendations- Evidence base recommendations are developed relying if possible on the results of research investigations. Expert opinion is utilized only when research evidence is not available. Evidence-base recommendations generally score the quality of the evidence taking into account the type and quality of the studies i.e. well conducted randomized clinical trials being considered the highest and expert opinion the lowest. Meta-analyses are often used to systematically combine data from existing studies. The relevance and coherence of the data i.e. presence or absent of fatal flaws is also utilized when scoring the quality of the evidence as good, fair or poor. When the quality of the evidence is good or fair evidence-based recommendations also score the magnitude of the impact as substantial, modest, small, and zero or negative. The scores for quality of the evidence and for the magnitude of the impact are then combined to produce grades of A (must implement) B (should generally implement) C (may implement for specific individual or situation based on practitioner's/patients judgment) D (don't implement) and I (insufficient evidence or I don't know). Cost considerations are generally incorporated into evidence based recommendation only for "close calls". Prediction rules are being developed that aim to improve the performance of evidence-based recommendations by define the characteristics of groups and individuals who are most likely to benefit from a recommended intervention.

Decision Analysis and Cost Effectiveness Analysis- Methods for displaying potential choices and the resulting outcomes in the form of a decision tree. Decision analysis defines the potential outcomes and the probability of occurrence of each outcome. The value or utility placed on each outcome by groups or a particular individual can then be incorporated. Decision analysis can quantitatively compare the potential outcomes by combining measures of probability and utility. Decision analysis is limited by the need for large quantities of data, issue of measurement and definition of utilities, and the need to incorporate risk taking tendencies in realistic decision making. None-the-less decision analyses are increasing being used in clinical and policy oriented decision making. Cost-effectiveness analysis introduces financial cost as an additional characteristic and generally defines benefits in terms of quality adjusted life-years (QALYs). Decisions on acceptable costs per QALY require consideration of what society as a whole values and can afford.

VI. Applications to Policy, Basic and Clinical Sciences

1. Outbreak investigation
2. Testing and Screening
3. Public health policy

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4. Special Applications - molecular/ genetic epidemiology, environmental/occupational, behavioral

Key Concepts

Outbreak Investigation– An outbreak is an epidemic limited to localized increase in incidence of a disease e.g., in a village, town, or closed institution (Last). The concept of an outbreak is no longer limited by geography. National and global outbreaks now routinely occur based on the rapid and global distribution of goods as well as movement by individuals, plants and animals. An outbreak does not imply an infectious disease source. Pellagra the classic outbreak investigation turned out to be a nutritional deficiency. Current outbreaks may be due to environmental factors, introduction of new drugs or treatment, or a variety of other factors. Outbreak investigation requires developing a case definition, measuring attack rates and examine the strength of the relationship between potential causal factors and the presence of the disease or condition.

Testing- Testing for diagnosis is the most commonly examined use of testing. However, testing implies the use of information e.g. history, examination, technology to make decisions and therefore has numerous applications including environmental assessment, assessment of individual prognosis, and identification of risk factor that increase the probability of future events. Ideally testing utilizes precise i.e. reproducibility, repeatability technology that produces the same or nearly the same results when repeated. under the same conditions and read/interpreted by an independent observer. Tests are evaluated using the measures of sensitivity (positive in disease) and specificity (negative in health) that measure the performance of the test itself in the presence and absence of disease. The meaning of a positive test i.e. predictive value or post test probability of a positive or negative test, depends on the pretest probability of the disease. Pretest and post test probability can be related using Bayes' Theorem. The pretest probability of the disease or condition may be estimated by taking into account the epidemiological prevalence of the disease and the presence of risk factors plus the presenting symptom pattern. Bayes' Theorem has applications outside health and medicine such as in the assessment of lie detector tests and the performance of security checks.

Screening test- Screening implies the use of testing in individuals without symptoms suggesting a specific disease i.e. asymptomatic for a particular disease. An initial screening test is rarely sufficient for diagnosis thus screening usually requires a testing strategies and follow-up. Ideal criteria for successful screening require that the disease or condition 1) produces substantial morbidity and/or mortality 2) early detection is possible and alters outcome 3) screening is feasible i.e. can identify an adequately high risk population and utilize an efficient test strategy 4) is acceptable in terms of harms, costs, and individual acceptance. Strategies for screening include use of testing in sequence or simultaneously. Use of simultaneous test may be useful when one test identifies one type or location of disease and the other test identified a disease of a different type or location. Simultaneous testing requires more tests and it therefore generally most costly.

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Applications beyond disease- Epidemiology has important uses beyond its traditional focus on morbidity and mortality from disease and other conditions. A variety of fields draw heavily on epidemiological principles and epidemiological methods including for example policy analysis, political science, marketing, social and behavioral research, educational research, genetics, and screening for security and forensic purposes. Epidemiology as a population science helps structure research and decision making to ensure consideration of denominators as well as numerators. Rigorous study design, standards for precision and accuracy of measurements, and analytical rigor are hallmarks of epidemiology that contribute to a wide range of disciplines. Standards for determining cause and effect and effectiveness utilized in epidemiology are gaining wider recognition and use. The study of epidemiology provides solid grounding for pursuit of research and applications in a broad range of disciplines. Thus epidemiology may be viewed as a scientific way of thinking as well as the basic science of public health.

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Appendix C

ASPH Task Force on Undergraduate Public Health's Statement on Recommended Content for an Introductory Undergraduate Public Health Course

The following Statement was approved by the ASPH Task Force on Undergraduate Public Health in 2004 and revised in 2005. It preceded and helped inform the report of the Consensus Conference on Undergraduate Public Health Education

Statement on Recommended Content for an Introductory Undergraduate Public Health Course

The Institute of Medicine in its report titled *Who Will Keep the public Healthy? Educating Public Health Professionals for the 21st Century* recommended that "...all undergraduates should have access to education in public health."¹ To implement this recommendation the Task Force on Undergraduate Public Health Education of the Association of Schools of Public Health² endorses the following:

A public health course should be built upon a population perspective and provide a multidisciplinary/ ecological understanding of disease causation and prevention. It should emphasize health issues that affect society as a whole as well as those that affect vulnerable populations.

An introductory undergraduate course in public health should include the following:

- An historical perspective on the contributions and roles of public health including the structure and functions of public health institutions
- An introduction to epidemiological and biostatistical principles including concepts of rates, causation and disease surveillance
- Determinants of health from a global perspective including environmental, social, and behavioral as well as biological and access to health services³
- An introduction to selected tools of disease control and health promotion including interventions such as vaccinations, screening, counseling and education, environmental-occupational, legal, and policy approaches as well as the roles of health communications.

¹ Gebbie K, Rosenstock, Hernandez LM. *Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century*. Washington D.C.: National Academy Press 2003:144

² The Task Force includes membership from Schools of Public Health with undergraduate majors and minors as well as CEPH accredited Programs affiliated with the Association of Teachers of Preventive Medicine

³ Gebbie K, Rosenstock L, Hernandez LM. *Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century*. Washington D.C.: National Academy Press 2003:33.

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- Issues of health care delivery addressed from a population perspective including such issues as quality, cost and access as well as organizational structure and their relationship to public health services.

The Task Force recommends that an introductory course designed using this approach should be available for all undergraduates and that this course content be part of general undergraduate education. This course is strongly recommended for those students considering entering a health profession. It is also suggested that health related professions consider recommending this type of undergraduate course for those who seek to pursue graduate education.

¹ Gebbie K, Rosenstock, Hernandez LM. Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century. Washington D.C.: National Academy Press 2003:144

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