A continuing education program for nurses in public health and community-based organizations was provided to increase their epidemiological knowledge and skills for application to nursing practice. The systematic analysis, interpretation, and use of health data are necessary to identify health status, plan programs, and evaluate outcomes, and constitute a required competency for nurses working in public health agencies (U.S. Department of Health and Human Services, 2000).

BACKGROUND: DEMONSTRATION OF NEED AND TARGET AUDIENCE

According to the Public Health Workforce Study prepared by the U.S. Department of Health and Human Services, Bureau of Health Professions, Health Resources and Services Administration (2005), public health workers lack formal training, especially in the core public health concepts. Findings identified key areas of support needed by public health workers related to critical public health skills and competencies.

abstract

As concerns mount surrounding exposure to environmental hazards and other public health threats, skills in surveillance and outbreak investigation are becoming critical competencies for public health and community-based nurses. This article describes a continuing education course designed in collaboration with a variety of stakeholders to address the need for epidemiological skills for rural nurses working in community-based settings. This project was funded through the Health Resources and Services Administration’s Public Health Nursing Continuing Education program and was offered in both in-person and online formats. Topics, including applying epidemiological techniques to plan, implement, and evaluate public health programs, were taught using case studies and an array of online resources. Evaluation measures reflected improved understanding of epidemiological methods, a high level of satisfaction with the course and faculty, and strategies for applying these skills in professional nursing practice.


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These could include tuition reimbursement, release time, and increased availability of distance education or Web-based course offerings. Other recommendations included encouraging schools to be more responsive to the educational needs of local health departments and to identify models of collaboration between academia and public health practice (http://bhpr.hrsa.gov/healthworkforce/reports/publichealth/default.htm).

The epidemiology course developed for community and public health nurses addressed these issues by providing workforce development opportunities that were developed with learner needs, were offered at no charge, and included an online option. Despite the state health plan that calls for a sufficient and competent public health workforce developed through a collaborative information and education network as well as continuing education, universities within the state had limited continuing education opportunities for practicing community and public health workers, especially nurses working in rural communities. Since 2004, a Consortium for Emergency Public Health Preparedness, composed of 14 health departments serving southeastern Wisconsin, had spent almost $300,000 for continuing education for its workforce, mostly in institutions out of state and focusing on epidemiology knowledge and skills. A statewide survey conducted in 2005 to determine interest in and need for continuing education and graduate-level coursework reported that more than 80% of public health workers were interested in epidemiology coursework. Of the 262 public health workers who responded to the survey, 41% (n = 142) were nurses (Nielsen, Anderko, Healy-Haney, Martocci, & Ridgeman, 2006).

The mission of public health is to ensure conditions in which people can be healthy. Responsibilities of public health professionals include preventing epidemics and the spread of disease, protecting the public against environmental hazards, and promoting healthy behaviors. To accomplish this mission, one core function includes the assessment of information on the health of populations. Epidemiology is an essential skill for addressing this core function (U.S. Department of Health and Human Services, Bureau of Health Professions, Health Resources and Services Administration, Public Health Nursing Continuing Education Section, Public Health Nursing Continuing Education Section, 2004, p. 14). The professional development course, Applied Epidemiology for Community-Based Nurses (Applied Epidemiology), was designed to address these needs by improving community and public health nurses’ competencies to detect community health problems early and respond effectively.

This course targeted a number of these essential public health services, including:
1. Monitoring the health status of communities.
2. Diagnosing and investigating health problems and hazards.
3. Assuring a competent public health work force.
4. Evaluating the effectiveness and quality of population-based services.

PROJECT DEVELOPMENT
Grant funding was awarded from the U.S. Department of Health and Human Services, Bureau of Health Professions, Health Resources and Services Administration, Public Health Nursing Continuing Education Section to modify an existing epidemiology course that had been provided to health care professionals at local health departments. Modifications specifically addressed the needs of community-based and public health nurses and considered methods for delivering the course in rural locations (e.g., using an online format). Barriers described in earlier studies and also by the steering committee for this project were considered in the development of the epidemiology course, including accessibility, time constraints, and financial limitations (Beatty, 2001; Pearson & Care, 2002; Penz et al., 2007).

WORK PLAN DEVELOPMENT USING THE LOGIC MODEL
The Logic Model, as developed by the W. K. Kellogg Foundation (2004), was used as a framework in guiding course development. This model required that resources, objectives, activities, outcomes, and effect were analyzed and developed for the project, as described later. A critical objective of the planning process was the establishment of a statewide steering committee to identify specific learning and delivery needs for nurses, particularly in rural areas. This steering committee included key stakeholders and organizations that could leverage resources to provide this course, including an academic continuing nursing education department, a regional public health training center, and state and local health departments.

The Applied Epidemiology course built on previous resources and was adapted from a course offered in 2006 for employees of 15 health departments in the Milwau-
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The syllabus, workbook, textbook (Hebel & McCarter, 2006), PowerPoint presentations, and learning activities were adapted specifically to address the issues of relevance to public health and other community-based nurses. For example, many nurses in rural areas are responsible for environmental health services in addition to more traditional activities, such as immunization clinics, and were interested in learning more about using epidemiological data to determine potential risks in their communities.

Based on input from the steering committee and the need to limit the amount of travel to the course, the in-person course was modified from a 6-day, once-a-week course (48 hours), to a 4-day, twice-a-week course (22 hours). The in-person course was offered in two rural locations in Wisconsin. The online format included the same content and learning activities (e.g., case studies) in four modules, with online discussion substituting for in-class group work. Twenty-two contact hours were provided to participants who completed the course in either format. Grant funding provided the course and its materials at no cost to the participants, although the majority of participants or their agencies needed to assume costs related to travel, hotel stay, and meals.

### TABLE 1

<table>
<thead>
<tr>
<th>Day/Module</th>
<th>Learning Objectives</th>
<th>Examples of Learning Activities</th>
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<tbody>
<tr>
<td>1. Practical Applications of Epidemiology and Review of Epidemiological Concepts</td>
<td>Interpret the distribution of disease in a population according to time, place, and person.</td>
<td>Using the United Health Foundation health rankings presented in the information sheet, what conclusions can you make about the health status of your state residents?</td>
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<td></td>
<td>Analyze incidence and prevalence rates.</td>
<td>Discuss the strengths and limitations of date and person-place-time characteristics (<a href="http://www.unitedhealthfoundation.org">www.unitedhealthfoundation.org</a>).</td>
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<td></td>
<td>Describe the relationship between incidence and prevalence.</td>
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<td></td>
<td>Explain the use of rates for comparative purposes.</td>
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<tr>
<td>2. Public Health Surveillance/Investigation of an Epidemic</td>
<td>Use attack rate to identify a vehicle of transmission in a common-source outbreak of disease.</td>
<td>After reading information on nationwide health tracking (<a href="http://www.cdc.gov/nceh/tracking">www.cdc.gov/nceh/tracking</a>; Late, 2007), specifically, fish consumption and mercury toxicity (Kobelo, Anderson, Imm, Peters, &amp; Smith, 2005), discuss your recommendation to a pregnant woman served by the WIC clinic about her daily intake of one can of tuna for lunch.</td>
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<td></td>
<td>Describe the Nationwide Health Tracking initiative and identify the public health implications.</td>
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<tr>
<td>3. Using Epidemiological Techniques to Plan, Implement, and Evaluate Health Services</td>
<td>Determine the appropriate rates (incidence, prevalence) to use to establish the need for public health programs (prevention, screening).</td>
<td>After reading the article by Briss, Brownson, Fielding, and Zaza (2004) and the chapter on nutrition in the Guide to Community Preventive Services (<a href="http://www.thecommunityguide.org/nutrition">www.thecommunityguide.org/nutrition</a>), describe the current evidence on multicomponent school-based nutrition programs. Is it recommended to use this intervention in your community?</td>
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<td>Describe the usefulness of sensitivity and specificity measures in the selection of a screening test.</td>
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<td>4. Making Sense of Associations, Causes, and Effects</td>
<td>Use the abstract of a journal article to ascertain purpose, target population, study design, and analysis.</td>
<td>After reading Harris et al. (2003):</td>
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<td>Describe five guidelines for judging whether an association is causal.</td>
<td>Describe the significance of using aspirin versus ibuprofen. Which NSAID provided a reduction in breast cancer risk?</td>
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<td></td>
<td></td>
<td>Based on the p value and confidence interval, does the relationship between ibuprofen and reduced risk for breast cancer appear to be causal?</td>
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<tr>
<td></td>
<td></td>
<td>Can these findings be translated into practice as a reasonable recommendation for women?</td>
</tr>
</tbody>
</table>

WIC = Special Supplemental Nutrition Program for Women, Infants, and Children; NSAID = nonsteroidal anti-inflammatory drug.
 COURSE DESCRIPTION
The course consisted of four modules that addressed the following essential public health services: monitoring the health status of communities (Modules 1 to 4), diagnosing and investigating health problems and hazards (Modules 1 to 4), assuring a competent public health work force (Modules 1 to 4), evaluating the effectiveness and quality of population-based services (Module 3), and exploring research for innovative solutions to health problems (Modules 3 and 4) (Council on Linkages, 2001). Table 1 details the module objectives and related activities.

The learning objectives of the Applied Epidemiology course were to:
• Assess data by using epidemiological and biostatistical principles.
• Apply epidemiological methods to plan, implement, and evaluate community health problems.
• Use epidemiological methods to critically evaluate evidence used in public health decision-making.

A variety of interactive teaching methods and materials were used to achieve course and module objectives, including in-class group problem-solving activities using “real-world” case studies. Course materials included:
• A study guide to epidemiology and biostatistics (Hebel & McCarter, 2006).
• A workbook for several content areas, including screening, morbidity and mortality rates, and ratios (Anderko, 2005).
• A course binder with selected materials, including PowerPoint lectures and data sheets.
• A listing of Web sites to support epidemiological methods (e.g., The Community Guide [www.the communityguide.gov] and United Health Foundation [unitedhealthfoundation.org]).
• Use of large public access data sets to apply epidemiological methods.

Participants who completed the course submitted an evaluation tool using a Likert scale that ranged from 1 (low achievement/satisfaction) to 4 (high achievement/satisfaction). The tool addressed achievement of learning and personal objectives, building on previous knowledge, format of the course, resources used, and expertise and teaching style of faculty as well as demographic information. In addition, open-ended questions were included as to what the nurse would do differently in the work setting as a result of this program, what the participant liked best, how the course could be improved, and topics for future programs.

RESULTS
Demographics
A total of 32 nurses completed the course (n = 24 in-person course and n = 8 online course). Eighty-five percent had a baccalaureate degree and 12% had a master’s degree. In terms of position, 52% were staff nurses. More than 75% of the participants in the in-person course traveled 51 miles or greater to attend the course: 50% percent of the participants traveled more than 100 miles and 25% traveled 51 to 100 miles. Online registration included 20 nurses; however, by the time the course began, a small number (n = 8) actually participated in the course.

Course Evaluation
Table 2 reports the results of the course for both the in-person and online formats. High scores were noted in

<table>
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<tr>
<th>Evaluation Statement</th>
<th>In-Person Courses (2) (Mean: 1-4 Scale)</th>
<th>Online Course (Mean: 1-4 Scale)</th>
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<tbody>
<tr>
<td>Assess data by using epidemiological and biostatistical principles</td>
<td>3.45</td>
<td>2.67</td>
</tr>
<tr>
<td>Apply epidemiological methods to plan, implement, and evaluate community health problems</td>
<td>3.55</td>
<td>2.67</td>
</tr>
<tr>
<td>Use epidemiological methods to critically evaluate evidence used in public health decision-making</td>
<td>3.56</td>
<td>2.67</td>
</tr>
<tr>
<td>The program met my personal objectives</td>
<td>3.41</td>
<td>3.50</td>
</tr>
<tr>
<td>The content built on my previous knowledge</td>
<td>3.75</td>
<td>3.67</td>
</tr>
<tr>
<td>The format of this course facilitated learning</td>
<td>3.85</td>
<td>3.67</td>
</tr>
<tr>
<td>The resources provided were useful (e.g., workbook, handouts)</td>
<td>3.60</td>
<td>3.67</td>
</tr>
<tr>
<td>The faculty demonstrated expertise in the topic</td>
<td>3.95</td>
<td>4.00</td>
</tr>
<tr>
<td>The faculty’s teaching style facilitated learning</td>
<td>3.75</td>
<td>3.67</td>
</tr>
</tbody>
</table>
both groups for achievement of personal objectives, useful resources, content building on previous knowledge, course format, and expertise and teaching style of faculty. However, the online learning group scored learning objectives substantially lower than their in-person counterparts.

Qualitative responses to the open-ended questions indicated how the participants would use epidemiology knowledge and skills in the work setting. Themes that emerged included an increase in the use of epidemiology for program planning, basing practice on scientific information, and evaluating outcomes.

LESSONS LEARNED

Despite interest and need, attending a series of sessions for a continuing education program presented challenges for participants interested in the in-person option. The demands of the in-person course schedule, which included 2 days back-to-back, affected the number of participants who could attend all of the sessions because of travel, work, or family responsibilities. In addition, offering one of the courses in the summer presented a number of challenges for interested nurses who were unavailable to participate in all or part of the course because of conflicting events (e.g., vacations).

The online format had a different set of challenges. A small number of those who registered actually participated. Among the participants, evaluation results for the overall course learning objectives were substantially lower than in the in-person group (Table 2). Several factors may have influenced these findings:

- Full participation in the four modules was limited and in some cases was completed in 1 or 2 days instead of the recommended 2 to 4 weeks. Those taking the course as designed were more positive in their evaluation and learning.
- Summer maintenance of the online learning system created some technological problems for accessing the course.
- All participants were new to online learning and required orientation to this method, creating some delays in beginning coursework.

CONCLUSION

This continuing education course addressed the critical need for public and community health nurses to improve their knowledge and skills in the area of epidemiology, a core competency for public health workers. One Midwestern state met the needs of rural public and community health nurses by offering a course that used applied learning techniques, easily accessible Web-based data sets, and an online format.

key points

Applied Epidemiology

1 Critical epidemiology skills for public health and community-based nurses involve the systematic analysis, interpretation, and use of health data to identify health status, plan programs, and evaluate outcomes.

2 Barriers of time, cost, and access need to be considered when planning continuing education for practicing nurses.

3 Effective teaching methods employ applied learning techniques that address the needs of practicing nurses.

Future planning of continuing education programs for public health and community-based nurses, especially in rural areas, need to consider the barriers noted both in the literature and with this program. Scheduling, cost, and familiarity with online formats are challenges that should be considered when planning future educational activities.

REFERENCES
Late, M. (June/July 2007). U.S. environmental public health tracking programs gain success: Partners working on nationwide net-


