

Jeffery Sumpter. A Baseline Assessment of Information Literacy Competencies of Students in the School of Public Health at the University of North Carolina at Chapel Hill. A Master's paper for the M.S. in L.S. degree. November, 2006. 72 pages. Advisor: Claudia Gollop

Information literacy competency involves the ability to understand the need for information and then to successfully find, evaluate, and use it. As information has become more easily accessible and abundant on the Internet, information literacy competencies have become increasingly important in academic disciplines. Health-related disciplines, especially public health, have been slower to realize the importance of these competencies.

A pilot project for the University of North Carolina at Chapel Hill's (UNC) Health Sciences Library, this study uses a survey questionnaire to assess the baseline information literacy competencies of students in UNC's School of Public Health. The results showed that a majority of graduate students demonstrated a high proficiency in information literacy competencies, but that a significant number of graduate students had important weaknesses in them. The results could be used to inform approaches to information literacy competencies' instruction and the design of future assessments.

Headings:

Health Sciences Libraries

Information Literacy

Information Literacy -- Assessment

Information Literacy – Competencies

Public Health

Public Health — Education

A BASELINE ASSESSMENT OF INFORMATION LITERACY
COMPETENCIES OF STUDENTS IN THE SCHOOL OF PUBLIC HEALTH
AT THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

By
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A Master's paper submitted to the faculty
of the School of Information and Library Science
at the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science
in Library Science

Chapel Hill, North Carolina

November, 2006

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Introduction

In its “Information Literacy Competency Standards for Higher Education Information,” the Association of College and Research Libraries (ACRL) defines information literacy as an individual’s ability to “recognize when information is needed and . . . locate, evaluate and use effectively the needed information” (Com, 2001, p.16). In 1989, the American Library Association’s Presidential Committee reported that competencies in information-seeking, knowledge, and management was vital for intellectual development and growth, career success, and the maintenance and improvement of quality of life and life-long learning (Brown, 1999). In recent years, with the rapid proliferation and increasing utilization of electronic information, information literacy competency education has become even more essential for personal and professional development and growth.

This is especially true in health-related fields, in which up-to-date and accurate information is essential to healthcare, health promotion and prevention, and health research. Only recently, however, has the concept of information literacy gained importance in health fields (Saranto K, & Hovenga, E.J.S., 2004). Departments of nursing, pharmacy, and medicine have taken the lead, with an increasing number integrating information literacy competencies into their curriculum.

Schools of Public Health, however, have been much slower to subscribe to this concept, even though information literacy competencies are very important to most public health disciplines. A main barrier to implementing information literacy competency assessment and training for students in schools of public health appears to be the diversity of perspectives, methods, and information needs that public health schools have. The School of Public Health at The University of North Carolina at Chapel Hill, for example, consists of eight departments: Biostatistics, Environmental Health Sciences, Epidemiology, Maternal and Child Health, Health Behavior and Health Education, Health Policy and Administration, Nutrition, and Public Health Leadership.

Information literacy programs in universities typically consist of two components, assessment and training. Assessments are conducted to determine the information literacy of a specific group(s), that is, their knowledge and skills pertinent to being able to “recognize when information is needed and . . . locate, evaluate and use effectively the needed information” (Com, 2001, p.16). In recent years, there has been growing interest in information literacy assessments at the college undergraduate and graduate level. Most often librarians design and carry out these information literacy assessments, which are typically survey questionnaires or exams. Based on assessment results, state boards of education, community colleges and universities, academic departments and disciplines, and libraries, among other entities, develop targeted training in information literacy competencies and allocate funds and resources for information services that address short-comings of students’ information competency skills and knowledge.

Information literacy competency assessments are made in order to determine the level of competency of a particular group, usually students. There are several methods that are consistently used to measure these competencies. One common method is to measure in an exam a group of students' information literacy competencies' level before and after information tasks' training. The training is directly related to the exam, and a comparison is made between the before and after results to determine whether the student(s) have improved, and if not, the competencies in which the student requires additional instruction. Another method is to integrate information competency skills and knowledge into course curriculum and periodically assess the information competencies of students with an exam. Both of the methods are relevant and useful for a relatively small population, such as a small group of students or for a particular course.

A third method is used to measure the baseline information competencies often of a large population of students. This method employs a survey questionnaire about tasks related to a broad range of information competencies tasks. The results of the survey can then be used to more effectively allocate library and instructional services and resources and to target specific weaknesses in information competencies of the student population. The results can also be compared to later surveys to determine if students have improved. This baseline assessment is most effective when the student population shares information needs, knowledge, and skills.

The purpose of this study is to assess the baseline information competencies of all students (undergraduate, graduate, doctorate) in the School of Public Health at the University of North Carolina at Chapel Hill. This research study has been developed to answer the question: What is the current level of information literacy competencies of these students?

This researcher does not know of any studies that have been designed to assess a broad, general range of information literacy competencies of students in a School of Public Health. Schools of Public Health are made up of a number of disciplines that have many common interests and information needs but also have a number of different perspectives and resources. Whether a single information literacy study can effectively measure the information literacy competencies at baseline of this diverse population is uncertain. But this data could serve as a basis for information literacy competencies' training and for guidance in the design of further assessments.

Literature Review

Introduction

There are few studies in the literature on information literacy competencies of public health students or professionals. For this reason, it has been necessary to locate studies of assessments from other disciplines. This literature review describes important information literacy studies, and it evaluates and compares them to show their relevance to a study that assesses the baseline information literacy competencies of public health students.

From a search of the relevant literature, two information literacy standards' documents, one peer-reviewed literature review on information literacy, and seven peer-reviewed empirical articles on information literacy were selected.

Reasons for Assessment in Research Studies

Information literacy studies from other disciplines outside of public health are relevant and useful because there is a general agreement, though with some variations, across disciplines as to the skills and knowledge that are pertinent to information literacy competencies. A number of information literacy studies have been done in academic fields other than public health, and there are a few that have been done in public health. The primary purpose of these studies has been to measure and improve the information literacy competencies of college students, as well as, in some cases, professionals.

Information Literacy Competency Standards

There are several information literacy competency standards that are used as the basis for assessments. Researchers most commonly use the ACRL's "Information Literacy Competency Standards for Higher Education." The ACRL has developed five information literacy competency standards and twenty-two related "performance indicators" (Com, 2001). These standards and indicators are used to inform assessments of students' information literacy competencies. The five standards are: "The information literate student . . . 1) "determines the nature and extent of the information needed;" 2) "accesses needed information effectively and efficiently;" 3) "evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system;" 4) "uses information effectively to accomplish a specific purpose;" 5) "understands many economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally" (Com, 2001, p.8-14). Under each of these standards are specific sets of skills and knowledge, or "performance indicators," that describe and establish outcomes for each standard.

The Health Sciences Library (HSL) at the University of North Carolina at Chapel Hill bases its *Core Information Literacy Competencies* on the broadly defined Association of Medical Colleges' Medical Information Objectives (Cor, 2004). (See Appendix A for complete *Core Information Literacy Competencies* of UNC's Health Sciences Library.) These core competencies are: 1) "Demonstrate the ability to identify and express an information need and plan a

search strategy to meet it . . . ; 2) “Demonstrate knowledge about information resources relevant to their field . . . ;” 3) “Exhibit good information skills . . . ;” 4) “Create and manage personal database using a standard bibliographic formatting software . . . ;” 5) Refer to and use relevant information resources in courses, tutorials, or information pages. . . .” (Cor, 2004). These are the core information literacy competencies that graduates of the five Health Affairs schools (Dentistry, Medicine, Nursing, Pharmacy, and Public Health) should have acquired.

Under each of these five broad core competencies are specific information-related tasks and knowledge. For example, students should have the ability to clearly articulate a research question, have knowledge of appropriate databases, and be able to evaluate and manage information and knowledge of information resources pertinent to a specific topic(s). These are the specific skills and knowledge that make up HSL’s information literacy competencies’ standards.

Literature Review of Information Literacy Assessments: An Overview

The California State University (CSU) established a program to assess all state university students’ information literacy skills and knowledge (Dunn, K., 2002). This assessment program is part of a larger effort “to educate students to be information competent in a complex, information-driven world” (Dunn, K., 2002, p.26). Other studies have focused on specific disciplines. Brown (1999) studied the information literacy competencies of Physical Science graduate students and, based on the findings, determined the instruction needed to improve them. In a public health study, Blumberg and Sparks (1999) assessed Master of

Public Health students' evaluation skills of information on the Internet to find out if instruction integrated into course work improved these skills.

Studies have been done within different frameworks and for other purposes. Some studies assessed the importance of information competencies in life-long learning, which is one of the important goals in information literacy competencies in general and of the UNC Health Sciences Library in particular (Cor, 2004). Dee and Stanley (2005) looked at the similarities and differences in information literacy competencies between twenty-five clinical nurses and twenty-five nursing students to find out whether the clinical nurses' information skills and knowledge had improved since college. Still other studies were conducted as part of an effort to integrate information competencies into course curriculum. Hausrath, Auyeung, Howell, and Bedell (2003) assessed the baseline and later the development of college students' information competencies in an allied health program with the goal of integrating these competencies into course work.

Literature Review: Information Literacy Competency Assessment in Health Fields

In a literature review, Saranto and Hovenga (2004) describe their assessment of the prevalence of information literacy research in health fields between 1995 and 2002. To determine that prevalence of information literacy research in health fields, the researchers performed searches of relevant databases to find out the number of study articles that were published between 1995 and 2002 on information literacy in health, nursing, and medical informatics. Using

the same Boolean keyword combinations, the researchers searched Medline, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and ERIC, an article database for education and related academic fields.

They found that information literacy was a relatively new concept in health disciplines. They located a relatively small number of study articles published on information competencies in health fields, but found an increasing interest in it after 1995 (Saranto and Hovenga, 2004). They located 286 articles related to this topic in PubMed and 25 articles in CINAHL and 0 in ERIC between 1995 and 2002.

In addition to conducting article counts, the researchers performed a content analysis of ninety-seven articles related to information literacy competencies to determine the context of the research. They found that: thirty-three articles dealt with “assessment of information or computer literacy;” twenty-six were about “description of (informatics) educational programs;” 11 articles focused on information literacy “curriculum development;” and 23 studies looked at “information system implementation” (Saranto and Hovenga, 2004, p. 507).

The researchers also analyzed which group of people (what the AAMC Medical Informatics Advisory Panel calls “roles”) each of articles pertained to (Cor, 2004). Populations in the article studies were nursing students and teachers, physicians, medical students, patients, and various other healthcare professionals. However, public health students and professionals were not identified as a role in any of these research papers.

In a content analysis of the articles, the authors found significant differences and confusion over the meaning of information literacy competencies. For example, information literacy was defined as basic computer skills, the use of information, and the knowledge of information. But many research articles used a definition close to the American Library Association's (ALA): "awareness of literature, and skills to locate, retrieve and evaluate, and apply information in critical thinking and problem solving" (Saranto and Hovenga, 2004, p. 507). How information literacy is defined will significantly determine specific information literacy competencies.

Describing, Evaluating, and Comparing Information Literacy Competency Studies

Blumberg and Sparks (1999) conducted a study to evaluate the changing uses and searching methods of the Internet and the information evaluation skills of first-year graduate students in public health. Students' willingness to accept information on the internet as valid, without critically evaluating it, motivated the researchers to conduct the study. Another concern of the researchers was the fact that students were able to access a great deal of information on a topic on the Internet but were not able to choose the most useful and relevant information. The researchers' objectives were to teach students the importance of searching for and evaluating evidence-based information for public health issues.

Study participants consisted of 25 first-year students in a Master of Public Health program (Blumberg and Sparks, 1999). Research, searching methods, and critical evaluation tasks were integrated into self-directed curriculum of a Masters

of Public Health program. Eight weeks into the first semester, as part of an exam, students were asked to list their most helpful resources, explain why they were helpful, and to evaluate each resource in terms of authority, accuracy, and currency. Exams were graded, and researchers provided feedback to students. Then, midway through the second semester, after students had experienced more training in these information literacy competencies, they were given an exam with the same questions.

The study's results suggested an improvement in students' information literacy competencies as a result of instruction in relevant information competency tasks received in the course work. The scores of the first exam showed that students often consulted the Internet in a general way for information and that they were not skilled at evaluating the information they found. Students often associated a large number of results with a successful search. A majority of the students searched for information from a variety of sources: Only six of the twenty-four participants consulted a specific site, such as the Center for Disease Control (CDC), for information.

The results for the second exam showed that students consulted the Internet less often for information and their ability to find and evaluate information on the Internet improved. Emphasizing the importance of a student's being able to evaluate data effectively, the author states that "one of the basic tenets of evidence-based practice is that one must critically review all the available data, by evaluating the accuracy and validity of the information gained" (Blumberg and Sparks, 1999, p.200). This is even more important for health

professionals, who must make sure that health-related decisions are based on the most valid and up-to-date information.

From students' answers on the second exam to questions about evaluating data in the literature, the researchers found five evaluation criteria that were commonly used. These were: "1) The validity of the information source; 2) the methods used to collect data; 3) the actual data; 4) the references, if any were cited; and 5) peer-review" (Blumberg and Sparks, 1999, p. 203). However, students did not utilize all of these criteria in their evaluations. 83 percent of the students, for example, used the information source as a measure of the data's validity, but only 13 percent identified peer-review as being an important evaluation method.

Most of these participants entered the Master's of Public Health program with little if any knowledge of information resources and skills in searching for and evaluating information. The study's results suggest that students' ability to understand and perform specific information literacy competency tasks will improve when information literacy problem-solving tasks are integrated into coursework.

Another study was done as part of a program to integrate information competencies into a community college's curricula (Hausrath, D., Auyeung S., Howell J., & Bedell, K., 2003). The researchers assessed the information competency level of students in the Allied Health program at the beginning and end of each class. The study was conducted within a development project to establish criteria for and instruction in information literacy competencies. A test

instrument consisted of a comprehensive set of both general and specific questions as well as information-problem scenarios. 450 students participated in the assessment.

The premise of instituting information literacy competency instruction was that, in the changing healthcare environment and health professions, “health workers, more and more, (are required) to work autonomously outside institutional settings, with the support of nearby hospitals or research libraries, likely often finding needed information via networked interactions” (Hausrath, D., Auyeung S., Howell J., & Bedell, K., 2003, p15). Public Health students face the same demands and changes, especially those who go on to work in rural health, disaster management, and in public health departments.

This study’s results were similar to those in the Blumberg and Sparks’ (1999) study, which found that when information competency instruction was integrated into course work, students showed significant improvement in information literacy knowledge and skills. The study also showed how baseline data is vital to improving information literacy competencies and developing training and instruction for them.

Another study took a broader, more general approach to information literacy competencies. Dickson (2003) wanted to determine, among other factors, what the information-seeking behaviors were of students in the College of Health at the University of Notre Dame, Australia. The study was done in order to collect data that would serve as the basis for the allocation training and information

resources to improve the library services and students' information literacy competencies.

One type of data collected was on students' information-seeking habits. The researchers used a focus group method to determine what these habits were and where the students were having problems finding information. Participants were members of each school, called "clients," in the College of Health. Each client group was represented in the focus group; in terms of students, this meant that undergraduate, graduate, and postdoctoral students participated.

Results showed that students needed more training in searching for information in the library, especially during their first year of studies. In particular, students needed instruction in how to search electronic databases. Hausrath et al. (2003) also found that new students had low overall scores in information literacy competencies and therefore required instruction in them. Additionally, the researchers learned that students needed instruction in how to use bibliographical organizing software (such as *EndNote*). Based on the baseline results of the focus group study, the researcher recommended that the library devote more time and resources to improving the information literacy of students.

Brown (1999) conducted a study that measured the baseline information literacy level of graduate students in the physical sciences at the University of Oklahoma. The study's goal was to make recommendations for programs and services that would improve the information literacy of graduate students in the physical sciences.

The author stated that information literacy competencies of graduate students in this program were crucial in order for them “to successfully complete in the rigorous requirements of their degree programs and subsequently become competitive in the world market” (Brown, 1999, p. 426). She also cited the ALA’s rationale for information-literacy that it supported economic independence and quality of life. The author cites reports that encourage research into information literacy and the establishment of standard competency benchmarks, but she found that no studies had been done on information standardizing literacy levels and assessment methods.

The researcher used an electronic survey, sent over e-mail, which asked students mostly open-ended questions related to how they thought about information needs, and how they searched, selected, evaluated, and organized information. Thirty-six of the sampled 143 students agreed to participate.

The researcher found that graduate students in the physical sciences at the University of Oklahoma had a “high degree” of information literacy. The research findings were unexpected, because, the author stated, other studies suggests that undergraduates typically have low information literacy levels and she thought it unusual for graduate students, many of whom would have learned information literacy competences as undergraduates, to score significantly higher in the assessment.

However, the study’s generalizability is uncertain because a very small number of students participated in it. That this was the only study in this literature review to find a high level of information literacy among all participants might

suggest that participants who were highly information literate self-selected to take the survey. These possible short-comings notwithstanding, an understanding of how these graduate students achieved a high level of competency would be useful in the design of information literacy competency training for other students. Establishing the information literacy competency level of students was, as in all the other studies, an essential first condition for developing effective instruction programs in information literacy.

As part of revised accreditation standards, Singh (2005) conducted a study to assess the information competencies of students in Journalism and Mass Communication programs at universities in the United States and to assess the impact of library instruction on student competencies. The revised accreditation standards included the Accrediting Council on Education in Journalism and Mass Communication's (ACEJMC) information literacy competencies, which were used as the criteria to measure faculty's perceptions of students' information literacy competencies' levels.

The new accreditation standard for Journalism and Mass Communication programs states that students should be able to "conduct research and evaluate information by methods appropriate for the communications professions for which they work" (Singh, 2005, p.294). As in other information literacy standards, one of the primary goals was to develop students into life-long learners.

The researchers mailed a survey instrument to 1,908 faculty who taught in accredited university journalism and communication programs in the United States. Four hundred twenty-five completed surveys were returned.

The study's results showed that undergraduate information literacy competencies were mostly adequate or poor but, as Brown's (1999) results showed, that graduate students' were mostly adequate or strong. These findings are important in that they show the necessity of allocating more training and resources in information literacy to undergraduates. The results also showed that a determining factor in a faculty participant's perception of his or her students' information literacy level was the extent to which he or she made library instruction a part of coursework.

The measure in this study of differences in librarian instruction on assessment outcomes is an important variable relationship that most other studies neglected to consider. The results from the Singh (2005) study showed that library instruction improved information literacy competencies, but there was relatively little library instruction integrated into courses. Dee and Stanley (2005) also measured the effect of librarian instruction on information literacy outcomes, finding that nursing students were much more likely to consult health information databases than clinical nurses (84 percent of nursing students accessed these databases compared to 24 percent clinical nurses).

Dee and Stanley (2005) studied the similarities and differences in information literacy between 25 clinical nurses and 25 nursing students in order to determine any contrasts in information-seeking habits and skills and whether the former nursing students had become life-long learners, in terms of information literacy, as clinical nurses.

This study also used a questionnaire to obtain data on information literacy, but it first trained the participants for two hours on how to use National Library of Medicine databases. The questionnaire, given before the training session, was anonymous and it was used to establish a baseline of subjects' information literacy level. Following the training, researchers conducted interviews with the subjects to flesh out their answers to the questions. Finally, researchers observed the searching behavior of each participant in the training session to compare their abilities in searching to their responses to the questionnaire.

The results showed that nursing students and clinical nurses were much more likely to get information from colleagues, faculty, or physicians and print sources than from electronic sources. Time and habit were important factors in locating information from these sources. The researchers found that nursing students and clinical nurses did not feel confident in their ability to use the health sciences or the hospital library. Although nursing students were much more likely to use these libraries, information-seeking conventions within the nursing profession created a barrier to their use of libraries. The study shows that factors other than instruction must be considered when evaluating assessment data of information literacy.

Dickson (2003) also discovered a variable related to confidence in using the library in her study: Participants felt a lot of anxiety in doing research in libraries. Additionally, Saranto and Hovenga (2004) found, in their content analysis of articles, that a person's confidence in his or her information-seeking

and information management skills and knowledge was directly related to level of computer skills and use.

One of the key concepts on which information literacy competencies is built was an important variable in the Dee and Stanley (2005) study -- life-long learning. An objective of their study was to see if information skills and knowledge that participants learned in college made them more information competent in their professions. Their results suggest that the participants did not take these competencies with them into their professions after college. However, nursing can be seen as a special case because of its tradition of relying on colleagues and doctors for information, and because time (as well as habit) is a significant factor. UNC's HSL has stated that the creation of the role of a life-long learner is a primary objective of its core information literacy competency objectives (Cor, 2004).

One study's baseline assessment was unique in its magnitude. The California Information Competence Assessment project's mission was to assess the information literacy level of all students in the California State University (CSU) system (Dunn, K., 2002). After much discussion, CSU decided to assess information literacy of students using three different methods over time. But in Phase I, it assessed the baseline information literacy of students using a telephone survey conducted by trained interviewers. The survey questions were informed by seven literacy competencies identified and defined by the CSU system and by the ACRL standards. 3,309 students were surveyed; the participation rate was 77 percent.

The results found that students who had more years of college education showed greater knowledge of the variety of information resources available for particular information requirements. This finding supports the results of other studies in this review (Singh, A.B. 2005; Brown, C.M., 1999). It also found that the students who could comprehend the content and context of these resources had a better understanding of how the resources related to their research strategy. Comprehending the content and context of information resources comes with experience in information literacy competencies, especially when applied to a student's field of study.

The author suggests that the assessment is a work-in-progress, that researchers will be better able to measure information competencies as they gain more experience in conducting and revising this assessment study. Similarly, Hausrath et al. (2005) recommended a periodic assessment of information competencies and constructive feedback and communication to improve assessments and outcomes.

Literature Review: Conclusion

A literature review found the concept of information literacy was relatively new to health fields. It also found relatively little, though increasing, interest in this topic in these disciplines and professions. However, that the authors discovered increasing interest in information literacy suggests that health fields are following other disciplines in realizing the importance of these competencies to students and professionals.

The empirical studies in this review tell us a lot about the variables that can influence or determine a student's information literacy competency level. Many of the studies found that librarian instruction improves competency outcomes. Moreover, experience in doing research improves outcomes: Graduate students consistently performed better in assessments. The studies also show that factors other than abilities can affect a participant's information literacy outcomes. Whether or not faculty integrated information competencies or library instruction into their course work has been shown to be an important factor in a student's information knowledge and information-seeking skills. These studies also show how important identifying and defining information competency standards are in designing an assessment instrument. Standards must be focused but broad and general enough to have relevance to diverse populations of students. These studies illustrate the complexity and variety in assessments.

However, researchers appear to be agreeing more on how assessments should be done. It would be useful if more research were done on the standardization of assessment instruments and measures. All of these studies measured information literacy competencies of students (and professionals) at baseline, an essential starting point for any plan to improve information literacy.

Methodology

This study was conducted using a web-based self-administered survey questionnaire designed to measure a broad range of information literacy competency tasks of students in UNC's School of Public Health. (See Appendix B for survey instrument of this study.) This study was developed as a pilot project to gain a general understanding of the information literacy levels of UNC Public Health students for the UNC Health Sciences Library, which would use this information to inform the development of information literacy competencies' training and information services to the School of Public Health, as well as for the design of future assessments.

The web-based survey method was appropriate for a pilot study because of its cost-effectiveness and efficiency, in terms of recruitment and data collection, compared to other methods. In general, the survey method is well-suited to studies that assess the baseline information literacy of relatively large theoretical samples. This was a cross-sectional survey: data was collected at one point in time.

The survey questionnaire was created as a research scenario to provide a meaningful information literacy context but also a consistent framework for participants. Moreover, the research scenario was chosen because the information literacy competencies of the UNC Health Sciences Library relate directly to knowledge and skills for conducting effective research. One of its first core competencies' tasks of the HSL "Core Information Literacy Competencies" is the ability to articulate clearly a research question (Cor, 2004). For this reason, and

because a focused research question is fundamental to effective research, the survey begins with the research question that establishes the research scenario context throughout the survey. The questionnaire consists of thirteen questions, ten of which are relevant to information literacy competencies; the remaining three ask for a participant's department, academic degree, and age, respectively.

The research question is: "What are the major causes of, and some of the interventions proposed for, the estimated 4 million neonatal (first 4 weeks of life) deaths in the world every year?" The content of the question was chosen because it was believed to have relevance to public health students in general. It refers to a specific population and health issues that could be approached from different public health fields -- epidemiology, which is a required core course for all UNC public health students, being the most obviously relevant. Moreover, this research question deals with both causes and interventions, both of which are core public health concepts.

Most of the information competency questions in the survey relate to this question. And the majority of the questions relate to core information literacy competencies as established by the HSL. These questions are based on specific tasks identified under the UNC Health Sciences Library's Core Information Literacy Competencies. A few questions do not relate to a specific core competency, but the researcher believed that the information-seeking skills and/or knowledge addressed by these questions were essential to assessment.

Question types were designed to fit the content and, in some cases, to facilitate students' recall and efficiency in answering. Most of the questions are

closed-ended but a few are opened-ended. The close-ended questions relate to concepts or resources that are specific and in some cases difficult to measure without providing answer choices. Moreover, specific answers in the close-ended questions help the participant understand the meaning of the question. The few open-ended questions are more basic and therefore can be answered and understood relatively quickly. Three of the questions are Likert-like: two are based on the scale from “very confident” to “not confident at all,” and one is based on the scale from “a lot” to “none at all.” One matrix question has been created to aid in understandability and efficiency in answering a question about evaluation of information sources.

The order of the questions is important. The sequence of questions is more or less related to the sequence of doing research on a topic. The research question is at the top of the survey. The first question is about which resource the student would go to first to find information on this topic. The ninth question is about organizing citations for research on this topic. The last question is out of place in the sequence – it is about how much experience the participant has had writing research questions – but it seemed the best place for it because, if it had been put in early, it may have interrupted the flow of questions.

A test of the online survey was conducted by the electronic survey developer in HSL before recruitment of participants began. It was tested again for errors by two HSL librarians and this study’s researcher.

The survey was approved by the UNC Institutional Review Board.

Population and Sample

The UNC School of Public Health (SPH) consists of eight academic departments, including Biostatistics, Environmental Health Sciences, Epidemiology, Maternal and Child Health, Health Behavior and Health Education, Health Policy and Administration, Nutrition, and Public Health Leadership. The study population consisted of the 1043 students currently enrolled in the School of Public Health and registered on its listserv, including undergraduate, masters, and doctoral students. (Enrolled students are required to register on this listserv, though it is possible that some of the 1043 enrolled students had not done this.) The recruitment e-mail message was sent to all 1043 students, which is the study's theoretical sample. 58 viable responses were collected from participants. This constitutes approximately 6 percent of the total study population.

More students had chosen to participate in the survey, but because of technical problems with the electronic survey form, they were not able to complete the survey and chose not to return to it after the technical problem was corrected. (See "Technical Issues with the Survey" section beginning on page 56 for a discussion of this problem.)

Procedure

In August 2005, a recruitment e-mail message was sent on the School of Public Health's general student listserv to 1043 students currently enrolled in the school, asking students to participate in the study, explaining consent, and providing the link survey's URL. (See Appendix C for recruitment and consent e-

mail message to participants.) An IRB application for this e-mail message was approved by UNC's Public Health IRB office on July 11, 2005.

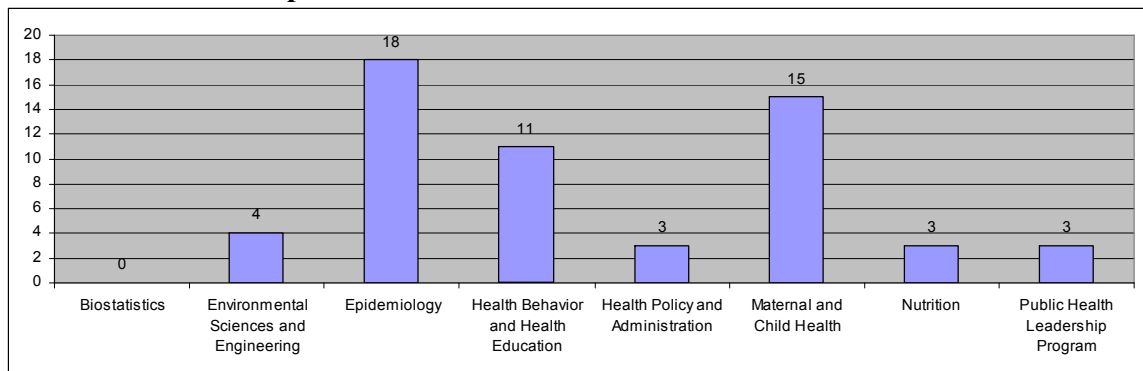
The e-mail recruitment message was not sent directly to the student but was submitted to the School of Public Health Director of Student Affairs, who then, after approving it, e-mailed it to all enrolled students over the e-mail listserv. Students who choose to participate accessed the survey by clicking on the URL link in the e-mail message. After a participant completed the study, the results of his or her answers were shown immediately on a Web page. In this way, the participant could verify that the system had accurately recorded his or her answers.

There was no inducement for participation, except that the UNC Health Sciences Library might use the study's findings to improve training in information literacy competencies for students in the School of Public Health and to allocate resources and services more effectively to these students.

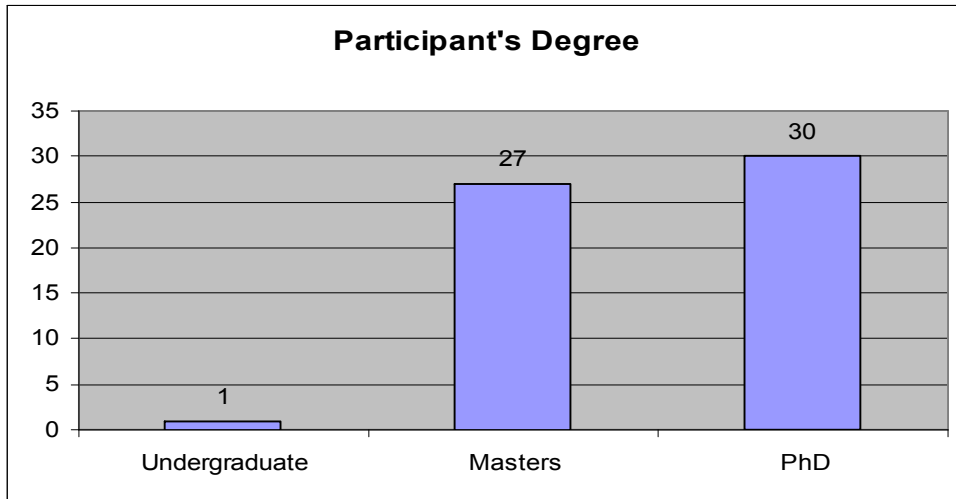
Results and Discussion

The study population consisted of 1043 students -- undergraduate, masters, and doctoral students in UNC's School of Public Health. All 1043 students were asked to participate in the study. Of these only 58 successfully completed the survey. 58 participants represent approximately 6 percent of the total. (For an explanation of the possible reason for the low participation rate, see "Technical Problems with the Online Survey" section beginning on page 56.)

Chart 1: Student Department of Enrollment in the School of Public Health



Most of the students who choose to take the survey were in the department of Epidemiology, in which 18 students or 31 percent of all participants were enrolled. Students in Maternal and Child Health had the next highest participation rate, with 15 students or 26 percent of all participants. The third highest number of respondents were from Health Behavior and Health Education, where 11 students or 19 percent were enrolled. Students from each of the remaining departments, except for Biostatistics – Environmental Sciences and Engineering, Health Policy and Administration, Nutrition, and Public Health Leadership – made up around 5 percent of the total participants. There were no participants from Biostatistics.

Chart 2: Academic Degree of Student

The majority of the participants were in doctoral programs, in which 30 participants or 52 percent of all participants were enrolled. Masters' students made up almost the same proportion of participants, with 47 percent of the respondents. However, only one undergraduate completed the electronic survey.

Survey Question 1: Please list the first resource you would go to for information on this research topic (examples: the name of a specific journal, web site, reference book, or database):

Table 1 – Frequency of First Resource Chosen by Participants

Information Resource Name	Number (n=58)	Percentage
Pubmed	28	48%
Google	10	17%
WHO website (World Health Organization)	5	9%
CDC (Centers for Disease Control)	4	7%
Bellagio Group Study	3	5%
HSL website	2	3%
UNICEF.	2	3%
CINAHL	1	2%
Google Scholar	1	2%
<i>The Lancet</i>	1	2%

Table 1 shows the frequency distribution of information resources that respondents answered they would go to first to find information on the research question topic. Twenty-eight students (48 percent) would search in PubMed for information about the causes and interventions of the 4 million neonatal deaths in the world annually. The next most frequent resource was Google, with ten students or 17 percent of the students answering that they would consult it first. Five students (9 percent) answered that they would search the World Health Organization web site (www.who.int) for this information. The remainder of the answers were evenly spread among seven other electronic information resources.

The survey's first question sought to discover specific information resource knowledge of public health students given the facts and issues in the research question. It is informed by the second "Core Information Literacy Competencies" for Health Affairs students: "Demonstrate knowledge about information resources relevant to (the student's) field by: Identifying key print and electronic resources," such as databases, Web sites, journals, textbooks and

reference sources (Cor, 2004). The question was open-ended and so allowed students to choose any resource type or format.

PubMed is the most comprehensive database for journal articles on health. It provides “over 16 million citations from MEDLINE and other life science journals for biomedical articles back to the 1950s” (Pub, n.d.). Moreover, PubMed’s *LinkOut* service connects citations to full-text articles from journals subscribed to by UNC Chapel Hill. The HSL offers instruction in searching PubMed to students and faculty in public health, as well as other academic disciplines. It is no surprise, therefore, that respondents chose PubMed as the first information resource they would consult for information on neonatal deaths.

However, that 17 percent of the student respondents would have gone to Google first suggests a lack of experience and knowledge in searching for public health information. Researchers at Kings College in London conducted an information literacy competency assessment that sought to measure, among other information literacy knowledge, the first information resource that a student would go to first for data. A major concern of some of this study’s researchers was that students would consult Google as their first resource, without being aware of this search strategy’s limitations (Haines, Margaret & Horrocks, Gary, 2006). Google provides access to an extraordinary range of information sources, much of which is suspect. Google can be a useful information resource for accessing health data, but information literate public health students should have more knowledge of specific health information resources that they could consult directly, resources that provide current, valid, authoritative, and relevant data.

Those respondents who choose specific health Web sites or health journals, such as the World Health Organization (WHO), the Centers for Disease Control (CDC), and the *Lancet*, among others, suggests that they have more experience in doing searches for health information. That none of the participants would have first searched a print resource supports to the widespread perception that print resources are seldomly used in health research anymore. It also shows how much students rely on the Web for research data.

Survey Question 2: Please select, in order of preference, up to 4 of the following databases that you would consult for information on this research topic:

1. PubMed
2. ISI Citation Databases (Web of Science)
3. Google Scholar
4. BIOSIS
5. CINAL
6. LexisNexis Academic
7. Academic Search Elite (EBSCOHost)
8. Alt-HealthWatch
9. Eldis: Country Profiles
10. NLM Gateway
11. Other (please specify) _____
12. I am not familiar with these databases.

Table 2: Frequency of First, Second, Third, and Fourth Choice of Database Participant Would Consult for Data on Research Question

First Choice of Database		
Database Name	Number n = 58	Percentage
PubMed	48	83%
Google Scholar	8	14%
CINAHL	1	2%
ISI Citation Databases (Web of Science)	1	2%

Second Choice of Database		
Database Name	Number n= 49	Percentage
Google Scholar	21	43%
PudMed	9	18%
ISI Citation Databases (Web of Science)	7	14%
CINAHL	5	10%
Academic Search Elite (EBSCOHost)	3	6%
LexisNexis Academic	2	4%
NLM Gateway	1	2%
BIOSIS	1	2%

Third Choice of Database		
Database Name	Number n = 32	Percentage
Academic Search Elite (EBSCOHost)	8	25%
ISI Citation Databases (Web of Science)	8	25%
Google Scholar	6	19%
LexisNexis Academic	5	16%
CINAHL	3	9%
Eldis: Country Profiles	2	6%

Fourth Choice of Database		
Database Name	Number n = 15	Percentage
Google Scholar	5	33%
CINAHL	3	20%
Academic Search Elite (EBSCOHost)	3	20%
ISI Citation Databases (Web of Science)	3	20%
LexisNexis Academic	1	7%

Table 2 shows the frequency distribution of the first, second, third, and fourth choice of database that a participant would consult for information on the research question about neonatal deaths. As with the answers in Table 1, most public health student participants would have gone to PubMed first, with 83 percent choosing this health database. Google Scholar was the second most popular choice. In fact, these two databases would be the primary database resources for participants, as together they make up 97 percent of the first choice databases and 61 percent of the second choice databases. ISI Citation Databases (Web of Science) and CINAHL (Cumulative Index to Nursing and Allied Health) were important resources for these students: They were the only databases other than PubMed and Google Scholar listed as a first choice, and they were listed as second, third, and fourth choices. Notably, as a second choice ISI Citation Databases (Web of Science) would have been used by 14 percent of subjects and CINAHL would have been used by 10 percent. Academic Search Elite (EBSCOHost) and LexisNexis Academic were also important database resources to respondents for information on the causes and interventions of neonatal deaths in the world.

This question sought to find out students' knowledge of databases for public health information. It was based on the HSL's second Core Information Literacy Competency – "Demonstrate knowledge about information resources relevant to (the student's) field by: Identifying key print and electronic resources: Databases (bibliographic and full text)," among other information resources (Cor, 2004).

In her article entitled “Expert Searching in Public Health,” Kristine Alpi (2005) writes that “awareness of a potential database to be searched is just the beginning. The searcher must assess whether the time . . . to perform the search will pay off in terms of the additional information it will yield” (p. 100). The choice of databases to find information on neonatal deaths involves much more than simply knowing about the database and having done some searches in it. It involves relatively extensive searching experience in a number of databases so that the student can compare the benefits, in terms of time and relevance of information resources, of searching each one for a specific kind of information.

The responses to this question suggest that the participants do have, with some qualifications, a broad knowledge and understanding of relevant and useful databases to consult for this information. That so many respondents would have consulted PubMed (www.pubmed.gov) makes sense in terms of a search strategy, because it provides accuracy, up-to-date, and comprehensive information. (A quick search of PubMed found highly relevant results.) Google Scholar was the second most popular choice; and the selection of this database (it is actually a browser but functions similar to a database) is a reasonable search strategy for this kind of information, because it is efficient and often effective for access to relevant articles.

Specializing in published research, Google Scholar is qualitatively different than Google. Google Scholar facilitates access to: “peer-reviewed papers, theses, books, abstracts and articles, from academic publishers, professional societies, preprint repositories, universities and other scholarly

organizations” (Abo, 2005). Its ranking of search results is based on sound researching criteria, “weighing the full text of each article, the author, the publication in which the article appears, and how often the piece has been cited in other scholarly literature. The most relevant results will always appear on the first page” (Abo, 2005). One important benefit of Google Scholar is that it enables users to do effective searches using relatively loose search criteria -- a keyword search will generate relevant results – though a more advanced search, through forms, is available. It is likely that students are more familiar with Google Scholar – and therefore chose it as a database resource -- because of experience using Google. Nonetheless, Google Scholar has increasingly developed a more accurate search engine and created access to an increasing number of peer-reviewed articles.

The range of resourceful health information databases that respondents selected also suggests that they have significant knowledge of these resources. Many choose Academic Search Elite, ISI Citation Databases (Web of Science) and CINAHL, all relevant database resources for information on neonatal deaths.

That the survey questionnaire provided the list of databases to choose from diminishes the validity of these results. A better indication of students’ knowledge and use of databases might have been obtained from an open-ended question. This study’s researcher opted to provide the list of databases in order to make taking the survey faster for participants and to prevent frustration from participants’ not being able to remember the names of particular databases.

Survey Question 3: Now, if you were doing a basic search in one of these databases on this topic, which terms would you use?

Table 3: Terms Used in One of the Databases in Question 2	N=57
Neonatal deaths or mortality	21%
causes, interventions, neonatal deaths, world*, global	12%
Neonatal deaths or mortality, intervention(s)	12%
neonatal deaths or mortality, causes, intervention(s)	5%
Neonatal death intervention, causes	5%
Neonatal death prevention, causes	5%
causes, neonatal deaths, worldwide, prevention	4%
neonatal death, invention, treatment	4%
Neonatal causes	4%
Other	28%

Table 3 shows the frequency of groups of terms identified by participants as ones they would use in a search of a database listed in question 2. Although a specific group of terms was not exact in every case, it was close enough for a valid grouping to be made. For example, the group “causes, interventions, neonatal death, world*, global” was listed by some participants using the term “worldwide” instead of “world;” some participants listed “world” but not “global;” and some identified these terms with “morbidity, international, mortality.”

The researcher refined the set of terms in order to create similar groupings that could be analyzed, based on the assumption that a search would have yielded similar results with a truncated term or additional terms in a participant’s list. To be sure, this approach to analyzing this data only allows for a rough measurement of this one aspect of students’ searching skills. However, the question –

identifying keywords in a search in a database on the topics in the research question – is too vague and open to produce useful information and therefore this rough analysis is perhaps better than any alternative ones – or none at all. A question asking for a description of a search strategy could have been more useful.

The results show that “neonatal deaths or mortality” was the most commonly chosen set of terms for this search, with 21 percent of the participants listing it. The term “interventions” was added to this set in a search by roughly 12 percent of the participants. 12 percent also added the terms “causes, interventions, and global, world” to “neonatal deaths.” This last set of terms takes in all the issues in the research questions – causes, interventions, and global – and therefore would presumably yield more relevant results in a search.

Some answers in the “other” category showed knowledge of search strategies. For example, one participant answered, “I would click on the MeSH link in PubMed to search for the appropriate MeSH terms. I would try things like ‘Mortality AND neonatal AND etiology AND (interventions OR treatment).’”

Survey Question 4: How confident would you feel in doing an advanced search on this topic using Boolean operators (AND, OR, NOT) in one of these databases?

1. Very confident
2. Somewhat confident
3. Not at all confident

Chart 1: Frequency of Confidence Level of Participants in Using Boolean Operators

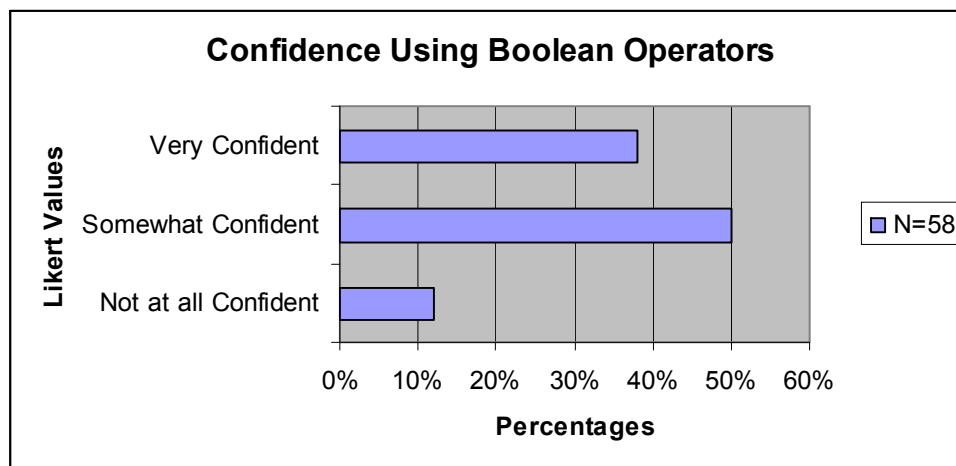


Chart 1 shows the frequency of the confidence level of participants in using Boolean operators. The questionnaire provided three confidence levels for subjects to choose from: “not at all confident,” “somewhat confident,” and “very confident.” 50 percent of students answered that they were only “somewhat confident” in using Boolean operators, and 12 percent were “not at all confident.” 38 percent of respondents were “very confident” in using them.

The effective use of Boolean operators is an important information competency that all graduates of public health should acquire, though it is not a stated HSL core information literacy competency. The results point to an area of weakness in information competencies of the majority of participants, especially the 12 percent who were “not confident at all.” For example, in order to perform effective searches on PubMed, the information resource of choice for the majority of the respondents, a user often must be able to use Boolean operators effectively. However, skillful use of Boolean operators is an advanced information competency skill. That 38% of respondents were “very confident” is a significant

result. This is an information literacy competency that librarians could target with more instruction.

Survey Question 5: Please list up to 4 websites you would go to for information on this topic:

1. _____
2. _____
3. _____
4. _____
5. I do not know specific websites with information on this research topic.

Table 4: Frequency of First, Second, Third, and Fourth Choice of Website Participant Would Consult for Data on Research Question

First Choice of Website		
Website Name	Number n= 49	Percentage
www.who.int	18	37%
www.google.com	9	18%
www.cdc.gov	6	12%
www.nih.gov	4	8%
PubMed	4	8%
Unicef	3	6%
www.marchofdimes.com	2	4%
Institute of Medicine	1	2%
http://www.lib.unc.edu/	1	2%
APHA	1	2%

Second Choice of Website		
Website Name	Number n= 43	Percentage
www.cdc.gov	12	28%
www.who.int	6	14%
UNICEF	3	7%
www.google.com	3	7%
www.who.gov	3	7%
Google Scholar	2	5%
NC Center for Health Statistics	2	2%
American Academy of Pediatricians	1	2%
http://www.who.int/en/	1	2%
JHUCCP	1	2%
march of dimes	1	2%
Medline Plus	1	2%
NIH	1	2%
Pubmed	1	2%
Webmd	1	2%
www.globalhealth.org	1	2%
www.mchb.hrsa.gov	1	2%
www.sophe.org	1	2%
yahoo.com	1	2%

Third Choice of Website		
Website Name	Number n = 22	Percentage
www.cdc.gov	5	23%
March of Dimes	3	14%
Google	2	9%
Google Scholar	2	9%
jstor.com	1	5%
NC Health Stats website	1	5%
Network for newborn survival website	1	5%
PubMed (not quite a web site)	1	5%
pubmed mesh browser	1	5%
UNESCO	1	5%
USAID	1	5%
US-HHS	1	5%
www.pubmed.org	1	5%
www.unicef.org	1	5%

Fourth Choice of Website		
Website Name	Number n = 18	Percentage
Google	4	22%
www.cdc.gov	2	11%
Dept. Health and Human Services surveys	2	11%
Lancet	2	11%
USAID	2	11%
acp. Com	1	6%
Gates Foundation	1	6%

Table 4 provides the frequency of first, second, third, and fourth choice of Web site resources that participants would consult for data on the research question about neonatal deaths. Most participants (37 percent) indicated that they would visit the World Health Organization’s website (www.who.int) first to find information about causes and interventions of neonatal deaths in the world. The majority of participants listed the CDC website as their second and third choice, 33 percent and 23 percent respectively, and 12 percent listed it as their first choice. Google Scholar was identified by many respondents as one of their top choices to consult.

This question seeks to discover students’ knowledge of Web sites that provide public health information, specifically information on neonatal deaths worldwide. The HSL’s second core literacy competency states that a student in any one of the five health-related disciplines at UNC, including public health, should be able to “refer to and use relevant information resources in courses, tutorials, or information pages by: Identifying and selecting appropriate print and electronic resources” (Cor, 2004).

A researcher's first choice of a Web site for specific data is important because it will determine the time spent on searching for data and it can determine which Web resources to consult after the initial search. Time, i.e., efficient searching, as Alpi (2005) points out in reference to the importance of having knowledge of databases, is an important factor in effective research on the Web.

Most participants indicated that they would visit the World Health Organization's website (www.who.int) first to find information about causes and interventions of neonatal deaths. The WHO Web site does provide current useful, relevant, and extensive information on neonatal the causes of deaths and interventions to prevent them. The majority of participants listed the CDC website as their second and third choice, 33 percent and 23 percent respectively. The CDC Web site also contains up-to-date information on neonatal deaths in the world, but its focus is on health issues in the United States and so it is not as useful an information resource for global neonatal health issues as the WHO Web site or even Google. Although it is not technically a Web site but is a Web browser, Google was identified by many students as one of their top choices to consult. Other Web sites identified by respondents, such as The March of Dimes, the NC Center for Health Statistics, and MedlinePlus mainly or exclusively provide information on neonatal deaths either nationally or locally, i.e., for North Carolina.

The results suggest that while public health student are knowledge about Web sites that provide relevant, authoritative, current, and accurate information on this topic, a number of these students do not have a good understanding of the

specific types or categories of health information that some important Web sites provide.

Survey Question 6: Which of these resources would you consult weekly or monthly in order to stay up-to-date on the above topic? (Choose up to 3 resources)

1. Web pages
2. newsletters
3. listservs
4. Saved search updates from a specific database
5. conference proceedings
6. print and/or electronic journal articles
7. newspapers
8. books
9. other (please specify) _____
10. I do not consult any resources

Table 5: Frequency of Resource Participant Would Use to Stay Up-to-Date with Neonatal Deaths' Issues

Website Name	Number n = 8	Percentage
Web pages	2	25%
Saved Search updates from a specific database	2	25%
Print and/or Electronic Journal Articles	1	13%
Other: Frequent Pubmed Searches	1	13%
Listservs	1	13%
I do not consult any resources	1	13%
Newspapers	0	0%
Newsletters	0	0%
Conference Proceedings	0	0%
Books	0	0%

Table 5 shows the frequency of specific resources participants would consult to stay up-to-date with information on neonatal deaths. Only 14 percent, or eight students, of participants answered this question. Of the eight who answered, two would consult Web pages, 2 would use “saved search updates from a specific database,” and three of the remaining four participants would use “print and/or electronic journal articles,” “other: frequent PubMed Searches,” and listservs. One chose the answer: “I do not consult any resources.”

Although it is not specifically addressed in the HSL’s Core Information Literacy Competencies, keeping up-to-date on a specific topic(s) is becoming a more important and relevant information literacy competency as databases, such as PubMed, provide e-mailed saved searches; health organizations, such as UNICEF, send current information updates on health issues via listservs; and electronic newsletters are made available on many health-related Web sites.

It is not possible for a public health student or professional to know about all the important articles on a specific topic or topics when they are published. But an informed public health student or professional would want to know when a significant article or book on an issue of interest or of relevance to his or her work is published.

That fifty respondents skipped this question could suggest that it was not relevant to their experience. Only 2 respondents answered that they used “saved search updates from a specific database,” and only 1 used a listserv. The results, especially the significant number of participants’ failure to answer this question, seem to show this is a weak competency for public health students.

Survey Question 7: How confident would you feel in using UNC’s Health Sciences Library’s Web site (www.hsl.unc.edu) to find electronic and print journals and other information on this topic?

1. Very confident
2. Somewhat confident
3. Not at all confident

Chart 2: Frequency of Confidence Level of Participants in Using UNC’s Health Sciences Library’s Web Site (www.hsl.unc.edu)

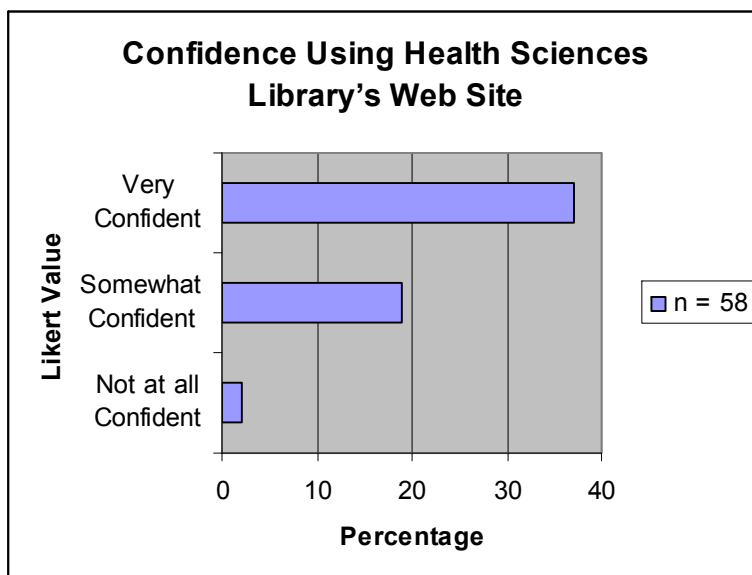


Chart 2 presents the frequency of the confident level of participants in using UNC’s Health Sciences Library’s Web site (www.hsl.unc.edu). 64 percent of respondents were very confident in using the HSL Web site, and 33 percent were somewhat confident. Only 2 percent were not confident at all in using it.

The second Core Information Literacy Competency of the HSL states that students should be able to “demonstrate knowledge about information resources

relevant to their field by: Identifying key print and electronic resources (through) accessing and retrieving information . . . using relevant resources such as: UNC-CH Health Sciences Library homepage” (Cor, 2004). The HSL homepage serves as a portal to core health databases, journals, and books, as well as videos, guides, tutorials, and other important resources and services. It is therefore essential that a student in UNC’s School of Public Health feel confident in using this portal to access information.

The results suggest that this is the case: The majority of students felt very confident in being able to use it effectively to find information. In addition, that most of the other respondents felt “somewhat confident” suggests that almost all of the public health students are using the HSL home page at least for some information. These results support continued promotion of the use of the HSL home page as a primary way for public health student to access data, as a way to raise the confidence level of public health students in using the portal.

Survey Question 8: How confident would you be in evaluating the information for currency, relevancy, accuracy, and authority?

Evaluation Criteria	Very Confident	Somewhat Confident	Not Confident at All
Currency			
Relevancy			
Accuracy			
Authority			

Table 6: Frequency of Confidence Level of Participants in Evaluating Information for Currency, Relevancy, Accuracy, and Authority

Currency			Relevancy		
	Number n = 58	Percentage		Number n = 58	Percentage
Very Confident	46	79%	Very Confident	40	69%
Somewhat Confident	12	21%	Somewhat Confident	18	31%
Not at all Confident	0	0%	Not at all Confident	0	0%
Accuracy			Authority		
	Number n = 58	Percentage		Number n = 58	Percentage
Very Confident	17	29%	Very Confident	19	33%
Somewhat Confident	37	64%	Somewhat Confident	33	57%
Not at all Confident	4	7%	Not at all Confident	6	10%

Table 6 shows the frequency of the confidence level of participants in evaluating information for currency, relevancy, accuracy, and authority. Respondents had the most confidence in their ability to evaluate information for currency, with 79 percent indicating they were “very confident” and 21 percent answering that they were “somewhat confident.” No participant responded “not at all confident.” Respondents had a high level of confidence in their ability to evaluate information for relevancy: 69 percent were “very confident” and 31 percent were “somewhat confident.” No participant answered “not at all confident.” In terms of evaluating information for accuracy, respondents had less confidence: Only 29 percent “very confident,” 64 percent were “somewhat confident,” and 7 percent were “not at all confident.” In evaluating for authority, respondents also had less confidence: 33 percent were “very confident,” 57 percent were “somewhat confident,” and 10 percent felt “not at all confident.”

The effective evaluation of information for currency, relevancy, accuracy, and authority serves as a foundation for information literacy. The second HSL Core Information Literacy Competency states that a student should be able to show understanding of information resources in their respective health discipline

by “selecting, filtering, evaluating, and reconciling information on a topic by: Discriminating among types of information sources in terms of: Currency . . . Authority, Relevance . . .” and a few other criteria (Cor, 2004). Moreover, as presented in the third core information literacy competency, a student should “exhibit good information skills by: ‘Maintaining a healthy skepticism about the quality and validity of all information (AAMC)’; and ‘Making decisions based on evidence, when such is available, rather than opinion (AAMC)’” (Cor, 2004).

In terms of evaluating information for currency and relevancy, the results show that public health students believe they have good skills and knowledge, though the meaningful proportion of respondents who were only “somewhat confident” implies the need for more instruction in these areas of information literacy. In terms of evaluation information for authority and accuracy, however, the results indicate that most public health students believe they do not have sufficient skills and knowledge. Based on these data, librarians should emphasize evaluating information, especially for authority and accuracy, in information literacy competencies’ instruction for public health students.

Survey Question 9: Please indicate how you would organize the citation information you collected:

1. Word document
2. Excel document
3. A bibliographic formatting software, such as EndNote or RefWorks
4. Other (please specify): _____

5. I don't organize citations

Chart 4: Frequency of Organization of Bibliographic Citations by Type
N=58

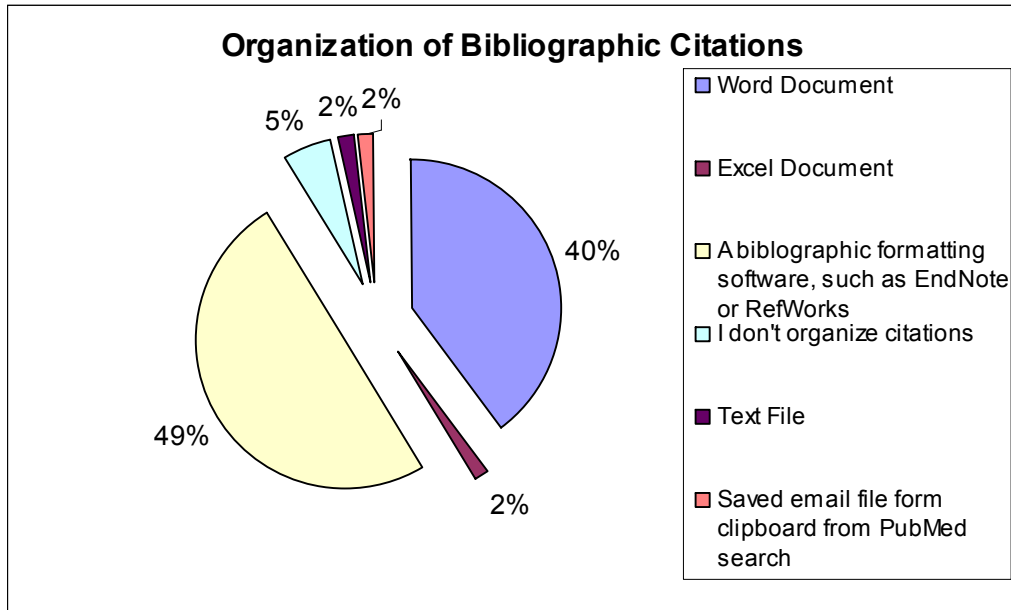


Chart 4 presents the frequency of organization of bibliographic citations by the type respondents used. 49 percent of the respondents would organize their bibliographic data using bibliographic software, such as EndNote or RefWorks. However, almost as many -- forty percent -- would use a Word document. 5 percent answered that they “don’t organize citations.” The remaining respondents organized their citations in an Excel document, a text file, or a “saved email file from clipboard from PubMed search.”

This question is based on the HSL’s fourth Core Information Literacy Competency: “Create and manage personal database using a standard bibliographic software, including: Downloading information from a database or web site” and “Using the information to create papers and bibliographies” (Cor, 2004).

Managing citation information in research is often frustrating and messy if the researcher is using a program other than standard bibliographic software for this purpose. 46 percent of respondents answered that they used a clumsy program, such as a Word or Excel file, for managing citation data. 5 percent do not manage citations. The results indicate, when generalizing it to all public health students, that there is a significant need for instruction of public health students in how to use a standard bibliographic software such as RefWorks or EndNote.

(From the HSL homepage, students can access a HSL Web page where they can download, as students, RefWorks for free. It also provides a free tutorial on how to use RefWorks.)

A caveat on the data: It is significant that 49 percent of the respondents answered that they use a “bibliographic formatting software such as EndNote or RefWorks” to manage their citations. This proportion seems high, suggesting a very high use of this type of software among students in public health. Given the small sample (6 percent) of this study, one of its limitations is that many participants with a high degree of information literacy may have self-selected to take part in the survey. The results for this question appear to support this fact. This possible limitation will be further addressed in the “Limitations of this Study” section of this paper.

Survey Question 10: How much experience do you have writing focused research questions, like the question about neonatal deaths in this survey?

1. A lot
2. Some
3. A little
4. None at all

Chart 5: Frequency of Level of Experience Participants Have Writing Focused Research Question

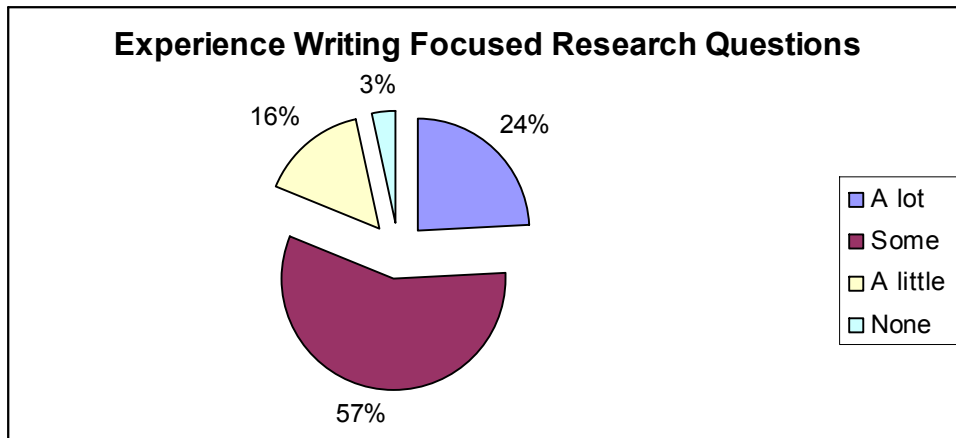


Chart 5 shows the frequency of the level of experience that participants have writing focused research questions. Participants could choose from “a lot,” “some,” “a little,” or “none” on the survey questionnaire. Most respondents (57 percent) only had “some” experience writing focused research questions. 24 percent has “a lot,” but 16 percent had “a little” experience formulating research questions. Interestingly, 3 percent had no experience writing these important questions.

The HSL’s first Core Information Competency states that students should be able to “demonstrate the ability to identify and express an information need, and plan a search strategy to meet it, by,” among other knowledge and skills, “clearly articulating the question or issue.” (Cor, 2004). That fifty-seven percent

of participants only had “some” and sixteen percent had “a little” experience suggests a need to improve public health students’ education in writing a focused research question. The 3 percent of respondents who answered that they had no experience writing research papers represent two participants and is not significant, though it is surprising since a lot of public health courses require writing research papers.

Conclusions

The study population consisted of all students in UNC's School of Public Health. However, because only one undergraduate student participated in the survey, the study results cannot be generalized to undergraduates but only to graduate students. In generalizing the results' analysis to students in UNC's School of Public Health, this assessment finds that a significant number of public health graduate students demonstrate a high proficiency in the HSL information competencies, but that significant number, roughly speaking around 35 – 40 percent, showed weaknesses in these competencies.

In general, public health graduate students showed a good knowledge of Internet and electronic database resources for information on the research question topic. However, it appears that a significant number of students would rely heavily on Google for their information. Because a meaningful proportion of students were not confident in their ability to evaluate information for authority and accuracy, this reliance on Google, which provides access to information from an extraordinary variety of sources, appears to be particularly problematic.

Moreover, the results suggest that a significant number of graduate students were not aware of the type of information that particular health organizations focused on and consequently made available on their Web sites. For example, the CDC concerns itself mainly with U.S. health issues, even though it does provide global health data. Finding information on neonatal deaths worldwide can prove frustrating on the CDC's Web site.

Perhaps the major areas where students demonstrated the most need for improvement were in evaluating information for authority and accuracy and in writing a research question. It is clear from their answers that many respondents lacked experience and knowledge relating to these competencies.

The researcher had planned to compare the data results of the undergraduate and graduate answers, but because only one undergraduate participated in the study this was not possible. Typically, information competencies' assessment studies have found that graduate students had a significantly higher information literacy level than undergraduates. Some studies' (Brown, 1999) results suggested that all graduate students exhibited a high level of information literacy. This study did not. However, it had meaningful limitations.

One possible limitation in this assessment appears to be that one information competencies' survey questionnaire design might not be appropriate for all the students in public health. The information needs and primary data resources of the different public health disciplines can be quite different. Even within a health discipline some students concentrate on domestic health issues while others focus on global health. As a result, they would often consult different resources. Moreover, students in some disciplines concentrate on quantitative analysis – for example, Biostatistics, Healthcare Administration, and Environmental Sciences and Engineering – but students in other disciplines look more at qualitative issues and would be assigned more writing – for example, Health Behavior and Health Education.

A more appropriate and useful approach might be to tailor assessments to the needs and content of each discipline in the School of Public Health. The departments most represented by students in this study appear to support this idea. 31 percent of all participants in the study were enrolled in Epidemiology, 26 percent were from Maternal and Child Health, and 19 percent were students in Health Behavior Health Education. The design of this study's survey questionnaire was built around the causes of and interventions for neonatal deaths worldwide. This topic would be more likely to interest students in these departments than in the others, each of which represented 5 percent of the participants in this study, except for Biostatistics which had zero.

Another limitation is the generalizability of the results to all public health graduate students. The small population sample may have been the result of participants' who had more knowledge and better skills in information literacy competencies self-selecting to take part in the study.

But the most significant limitation of this study had to do with technical problems with the online survey. It is probable that this played a role in the low response rate.

Technical Problems with the Online Survey

The recruitment e-mail message, in compliance with IRB requirements, contained the contact information (e-mail addresses and phone numbers) of the researcher and the faculty advisor. Not long after the recruitment message was e-mailed to participants, the researcher received eleven email messages from students who had tried to answer the survey but some of whose answers, when

displayed after the submission of the survey, were different than the ones they submitted. The faculty advisor was copied on some of these messages.

The researcher and the faculty advisor contacted the designer of the survey in the HSL about the problems participants had encountered. The designer fixed the error in approximately six hours time.

It is certain that participants who tried to answer the survey but had problems did not return to complete it after the researcher had informed them over e-mail that the survey was functioning correctly. It is not possible to say, however, how many participants had been lost due to the technical problems.

It is possible that these technical difficulties could have been avoided had the survey been tested more frequently and by more people before it was made available to participants. In hindsight, the researcher should have arranged for this degree of testing. At any rate, this study's technical difficulties with the electronic survey illustrate a potential serious problem with electronic questionnaires that should be minimized to the greatest extent possible before a study is begun.

Researchers who utilize an electronic survey in their study should seriously consider using SurveyMonkey, which is an online survey development and hosting company providing Web-based survey design tools, server space, and an electronic data collection service. SurveyMonkey has a highly relevant and thorough confidentiality policy. Importantly, it provides a stable electronic environment with a track record of sound survey functionality (Sur, n.d.).

SurveyMonkey, however, has a few potential important short-comings. Researchers can use it for free if their survey has no more than ten questions and for up to a maximum one hundred responses per survey. Surveys of more than ten questions and one hundred participants can be created on SurveyMonkey for a fee. Moreover, the design features for surveys on SurveyMonkey can be limiting. While survey designers can choose from several design formats for questions and answers, they may find that they are unable to present the questions and answers' selection in a manner necessary for clarity.

Another potential problem with SurveyMonkey is that participants might not trust its ability or sincerity to keep their information confidential.

Appendix A:

Core Information Literacy Competencies (Cor, 2004)

The AAMC Medical Informatics Advisory Panel considered what role the competencies would support. The roles they identified are

1. Life-Long Learner
2. Clinician
3. Educator/Communicator
4. Researcher
5. Manager.

We feel that these are the roles most of our graduates will fill to some extent. For our purposes, we use the term Professional for Clinician. And, it seems that most competencies are necessary for all areas.

Health Affairs graduates should be able to:

1. Demonstrate the ability to identify and express an information need, and plan a search strategy to meet it, by:
 - Clearly articulating the question or issue
 - Outline an action plan
 - Identifying how the information will be used:
 - Research
 - Decision making (patient care, community needs, etc.)

- Consumer education
2. Demonstrate knowledge about information resources relevant to their field by:
- Identifying key print and electronic resources
 - Textbooks and reference sources
 - Databases (bibliographic and full text)
 - Internet sites
 - Journals
 - Accessing and retrieving information from on and off campus using relevant resources such as:
 - Online Catalogs
 - UNC-CH Health Sciences Library homepage
 - Internet
 - Selecting, filtering, evaluating, and reconciling information on a topic by:
 - Identifying the factors that influence the accuracy and validity of information
 - Discriminating among types of information sources in terms of:
 - Currency
 - Format
 - Authority
 - Relevance

- Availability
 - Using multiple information sources
3. Exhibit good information skills by:
 - "Maintaining a healthy skepticism about the quality and validity of all information." (AAMC)
 - "Making decisions based on evidence, when such is available, rather than opinion." (AAMC)
 - Being aware of and correctly applying copyright and intellectual property guidelines and regulations
 - Adapting to the ever changing skills need for information management
 4. Create and manage personal database using a standard bibliographic formatting software, including:
 - Downloading information from a database or web site
 - Entering information not available by downloading
 - Using the information to create papers and bibliographies
 5. Refer to and use relevant information resources in courses, tutorials, or information pages by:
 - Identifying and selecting appropriate print and electronic resources
 - Using web tools to incorporate excerpts from or links to information resources

Appendix B:

Information Literacy Competencies of Students in the School of Public Health

Please read the following research question carefully and answer the questions related to it. Thank you very much for your participation in this study.

What are the major causes of, and some of the interventions proposed for, the estimated 4 million neonatal (first 4 weeks of life) deaths in the world every year?

1. Please list the first resource you would go to for information on this research topic (examples: the name of a specific journal, web site, reference book, or database):

2. Please select, in order of preference, up to 4 of the following databases that you would consult for information on this research topic:

1. PubMed
2. ISI Citation Databases (Web of Science)
3. Google Scholar
4. BIOSIS
5. CINAL
6. LexisNexis Academic

7. Academic Search Elite (EBSCOHost)
8. Alt-HealthWatch
9. Eldis: Country Profiles
10. NLM Gateway
11. Other (please specify) _____
12. I am not familiar with these databases.

3. Now, if you were doing a basic search in one of these databases on this topic, which terms would you use?

4. How confident would you feel in doing an advanced search on this topic using Boolean operators (AND, OR, NOT) in one of these databases?

1. Very confident
2. Somewhat confident
3. Not at all confident

5. Please list up to 4 websites you would go to for information on this topic:

6. _____
7. _____
8. _____

9. _____

10. I do not know specific websites with information on this research topic.

6. Which of these resources would you consult weekly or monthly in order to stay up-to-date on the above topic? (Choose up to 3 resources)

Web pages

1. newsletters
2. listservs
3. Saved search updates from a specific database
4. conference proceedings
5. print and/or electronic journal articles
6. newspapers
7. books
8. other (please specify) _____
9. I do not consult any resources

7. How confident would you feel in using UNC's Health Sciences Library's Web site (www.hsl.unc.edu) to find electronic and print journals and other information on this topic?

1. Very confident
2. Somewhat confident
3. Not at all confident

8. How confident would you be in evaluating the information for currency, relevancy, accuracy, and authority?

Evaluation Criteria	Very Confident	Somewhat Confident	Not Confident at All
Currency			
Relevancy			
Accuracy			
Authority			

9. Please indicate how you would organize the citation information you collected:

1. Word document
2. Excel document
3. A bibliographic formatting software, such as EndNote or RefWorks
4. Other (please specify): _____
5. I don't organize citations

10. How much experience do you have writing focused research questions, like the question about neonatal deaths in this survey?

1. A lot
2. Some

3. A little
4. None at all

General Background Questions

11. In which department in the School of Public Health are you currently enrolled?

12. What degree are you currently working on in the School of Public Health?

1. Undergraduate
2. Masters
3. PhD

13. What is your age?

Thank you very much for taking this survey!

Appendix C:**E-mail message to students in UNC's School of Public Health, asking them to participate in this study and explaining the terms of consent.**

This is a student-led project for UNC's Health Sciences Library to assess the research skills and knowledge of students in UNC's School of Public Health. The study consists of a survey of 10 questions related to these skills and knowledge, as well as 3 general background questions. The Health Sciences Library hopes to use the findings from this study to improve the research training and services it provides to students in the School of Public Health.

Your participation in the study is voluntary. If you choose to participate in it, your participation will be anonymous. Researchers will not collect or have access to IP addresses of respondents. Moreover, all of the data collected will be confidential. Data will be stored in a database on a server in the Health Sciences Library and will be accessible only to researchers and technical support personnel. There are no apparent risks in participating in the study and no direct benefits to participation. Your choice to take part in the study or not will not affect your class standing or grades at UNC-Chapel Hill. And you will not be offered or receive any special consideration if you take part in this research. You may choose not to be in the study or you may stop being in the study at any time.

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns about your right as a research subject, you may contact, anonymously if you wish, the Public Health Institutional Review Board at 919-966-9347 or by email to IRB_subjects@unc.edu.

By completing the survey, you are giving your consent to be in this study. It will take approximately 10 minutes to complete the survey.

You can access the survey by going to this web address: <web address here>

Thank you very much.

If you have any questions, please contact Jeff Sumpster, Principal Investigator, by e-mail to jssumpste@email.unc.edu or Julia Shaw-Kokot, Faculty Advisor, by phone at 919-966-0952 or by email to jsk@med.unc.edu.

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