

Information Deluge

The Power and Promise of the IT Revolution

*Neil Rambo
Sherrilynn Fuller*

Public health is an information-based enterprise. The expanding ability of researchers, educators, policy makers, and practitioners to harness the power of information technologies (IT) is one of the major trends influencing public health in the new century. A few years ago in an article in this magazine, O'Carroll and Bell concluded that the World Wide Web "is one of the most exciting new resources available for public health practitioners. We cannot ignore the tremendous wealth of available public health information and the myriad potential uses of the Web for information sharing, training, research, and data distribution."

They also clearly identified the Web's negative aspects: information overload, lack of organization, technical barriers, and social considerations such as access policies, confidentiality, and liability; and useful but clumsy or difficult-to-work-with aspects such as security systems, interactive submission of data, and network capacity limitations. They had the foresight to realize that the Web would require substantial work before it "becomes an effective and integral part of modern public health practice."

Though written just four years ago, their analysis represents one of many developmental cycles in the still young life of this rapidly evolving technology. Even so, O'Carroll and Bell called it quite accurately. What was good then about the Web remains an enduring strength. In ease of use and relatively low cost, it is unsurpassed as a publishing and dissemination medium. The creative work of technology innovators and others has ameliorated some of the negative aspects during the intervening years. Technical barriers decline as hardware capacity and processing speed increase and prices continue to decrease.

Although much more remains to be done to adequately address issues related to access, including the "digital divide" that threatens to create information haves and have nots, awareness of these problems is growing, along

with some efforts to address them. Software and networking solutions have vastly expanded the power and the reach of the Internet. A case in point is e-commerce, which has taken off in the last year or so with the wide deployment of interactive forms and secure data transmission; however, health care use lags other sectors. Sophisticated, interactive public health applications may not be driven by a commercial engine, but they require the same building blocks that have fostered e-commerce.

How to stop worrying about information overload and learn to love the Web . . .

Two problems articulated by O'Carroll and Bell in 1996 persist: information overload and lack of organization on the Internet. The current picture is both better and worse — worse in the sense that the burgeoning spread of online information continues without letup. A recent study estimated more than 800 million publicly accessible Web pages of which only 6%, nearly 50 million pages, are scientific or educational in content. This flood of information is staggering, and information overload seems inevitable.

But there is good news too. Web-based search engines have become more sophisticated. Simple keyword searching — a starting point for most search engines — is a crude instrument in this chaotic information universe. Powerful and creative indexing techniques, combined with enhanced searching features, help improve the performance of these tools. This strategy can lessen the burden of information overload and relegate it to the level of background noise.

In addition to improved search engines, another tool that can help the information seeker manage the Web is a subject directory — a kind of "meta-Web site" that provides a rich organizational feature set and pointers to other sources for relevant, high-quality information. Directories typically perform

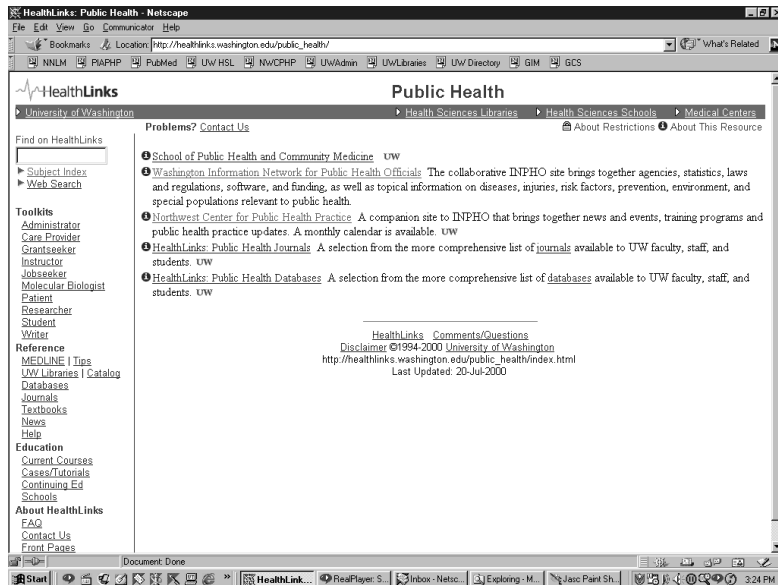


Figure 1: The public health index page on the UW HealthLinks site connects to numerous useful information sources.

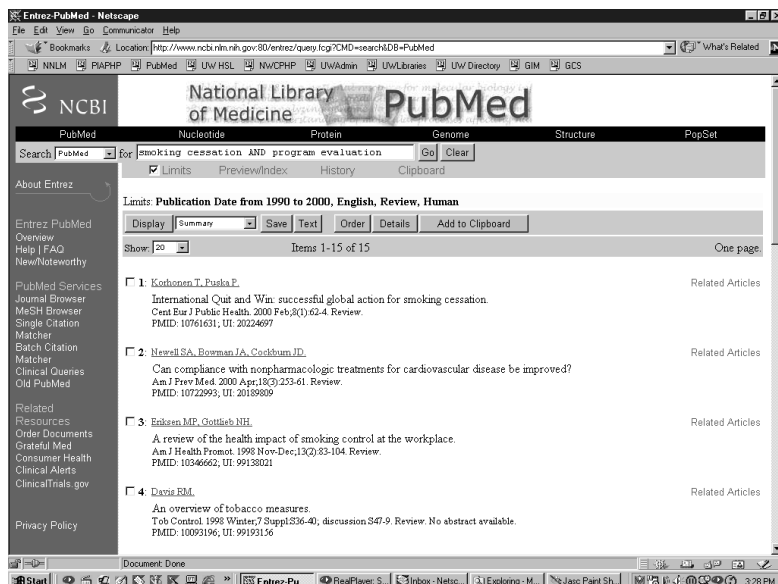


Figure 2: A focused search on PubMed can identify the most pertinent articles and simplify information retrieval.

several useful functions. They provide a gateway to the major sites in a particular subject, a sense of “what is out there,” and a conceptual framework for those unfamiliar with the subject or the resources. Perhaps most importantly, directories provide at least some measure of quality assessment and filtering of information. Some directories may perform this function only implicitly, whereas others have explicit criteria for inclusion of sites and systematically evaluate their quality and the information offered. Combined with better and more powerful search engines, the use of value-added services such as subject directories can further decrease the problem of information overload.

Two examples of directories are the public health index page on the University of Washington’s HealthLinks site (Figure 1) and the Washington State Department of Health links page located at <http://www.doh.wa.gov/Links/links2.htm>.

Power Tools

Learning to use these tools — search engines and specialized subject directories — is a useful strategy toward managing the chaos of Web-based resources. In addition, several specialized search engines can provide organized access to journal literature, technical reports, and public data sets. Several such tools developed and supported by the National Library of Medicine (NLM) and the Centers for Disease Control and Prevention (CDC) are useful for public health practitioners (sidebar, page 13).

Figure 2 shows the results of a PubMed search on “smoking cessation and program evaluation” that limits the retrieval to review articles, English language, and publications dated from 1990 to 2000. This search retrieved 15 articles.

Unlike general Web search engines, PubMed does not search for Web pages, although it is Web based. It searches a highly structured and controlled database of biomedical and health-related literature. All the specialized tools listed above provide access to professional knowledge resources. One of the miracles of the Web is that these resources that were once difficult to obtain are now available to anyone (with a computer, Internet connection, Web browser, and skills), anywhere in the world, free of charge. Thus, it is technically

possible for a public health practitioner, regardless of location, to base program decisions on the best scientific evidence available. To achieve this goal, though, requires more than technology. It requires awareness and training.

Information technology (IT) training, when available, often involves learning how to use an operating system or how to use a particular software package, such as to create and manage databases. However, to be most effective, training should occur in the context of real work problems and be related to an immediate need. Schools of public health, in collaboration with state and local health jurisdictions and health sciences libraries, have a vital role to play in providing IT training.

Training focused on using Internet-based tools for information and communication management to support practice is harder to find. One source is the National Network of Libraries of Medicine, which offers training at several regional centers throughout the country (see Information Resources, page 14). Some schools of public health also may offer training.

Despite recognition of the need for effective training in IT, it is difficult for public health agencies to allocate limited resources to provide it. Other barriers are the lack of experienced trainers and the competing demand for training in the core competencies of public health. Reliable sources of distance learning opportunities for the public health workforce — such as the CDC's Public Health Training Network and the Public Health Foundation — are joined through Partners in Information Access for Public Health Officials, an initiative to address the need for IT training. The Partners' Web site describes training programs (see Information Resources).

An Innovative Public Health Application

EpiQMS (Epidemiologic Query and Mapping System), with initial funding from the National Library of Medicine, is a system under development in a partnership between faculty at the University of Washington and epidemiologists and systems developers at the Washington State Department of Health. EpiQMS is a Web-based system allowing

Web Tools Developed by CDC and NLM

The greatest strength of the following tools is that they compile and organize a vast wealth of information. From a practitioner standpoint, however, the scope and comprehensiveness of these resources can be overwhelming. Each, though, has a sophisticated search interface that can help ease the burden of searching and shield the searcher from a flood of irrelevant information.

- *PubMed* is interface to MEDLINE, the premier biomedical and health care database of nearly 11 million citations and abstracts to medical, nursing, dental, allied health, and public health journal articles: <http://ncbi.nlm.nih.gov/PubMed>. *Strengths*: a flexible, powerful, easy to use system. *Weaknesses*: a resource of research knowledge designed to be used by other researchers; comprehensive rather than selective, so practitioners need to develop special search and critical analysis skills to use this resource effectively in public health practice.

- *HealthSTAR* is another NLM database, this one focusing on health services research and technology assessment literature. Use the Internet Grateful Med interface to search at <http://igm.nlm.nih.gov>. IT will be incorporated into PubMed by the end of 2000. *Weaknesses*: same as noted for PubMed.

- *HSTAT* is a full-text database and search system that covers technology assessments and reviews, practice guidelines, consumer guides, and consensus statements: <http://text.nlm.nih.gov/>. *Strengths*: a full-text (i.e., not bibliographic) resource for decision making; contains selected guidelines, reports, and protocols. *Weakness*: different search interface and method requiring different skills.

- *TOXNET* is a search system to several factual and bibliographic databases in toxicology and environmental health, produced by several government agencies: <http://sis.nlm.nih.gov/sis1/>. *Strengths*: authoritative source for factual information on toxicity and chemical hazards; estimated toxic chemical releases; and nomenclature, identification, and structural information. *Weakness*: a different search interface to learn.

- *CDC WONDER* is a search system to nearly 20 public data sets. *WONDER* allows you to search, for example, for the most recently compiled mortality data by heart disease and to specify, among other variables, state, county, race, gender, and age range. You can search anonymously or with a user name and password: <http://wonder.cdc.gov/>. *Strengths*: each data set has a search mask customized to fit specific features of the data; very detailed searching is possible; mix of data and text files, e.g., Prevention Guidelines Database. *Weakness*: time lag between data collection and national-level reporting can be several years.

Washington State citizens and medical and public health practitioners to access, at several geographic levels, aggregated data sets developed from Department of Health databases. Citizens will be able to determine the health status of their county or community and make comparisons with other areas or the state as a whole. Public health practitioners can use EpiQMS to support assessment and surveillance at several geographic levels to develop efficient and effective interventions. This sophisticated example of a geographic information system is now being tested and refined at the Department of Health.

A practical application of EpiQMS, through its street-level mapping capability, is in disease outbreak investigation. Smaller health departments do not have an epidemiologist on staff. To some degree, EpiQMS can supply this support by allowing departments to determine the location of cases and to calculate rates. This function supports assessment and surveillance activities.

We encourage you to use the tools mentioned in this article to explore the Web.

Recommended Reading

Lawrence S, Giles L: Accessibility of information on the Web. *Nature* 1999; 400:107-109.

O'Carroll P, Bell T: Public health practice and the World Wide Web: the good, the bad, and the ugly. *Washington Public Health* 1996; 14:38-41.

Information Resources

See <http://tribalconnections.org> for a National Library of Medicine-sponsored project, managed by the University of Washington Health Sciences Library, to increase technology and health information access among American Indian and Alaskan Native communities.

For more information on search engine features and performance, refer to Search Engine Watch at <http://www.searchenginewatch.com/facts/>. All the search services referred to in this article are free of charge and are available to anyone.

Information about the multi-agency and organization Partners in Information Access for Public Health Officials, sponsored by the National Library of Medicine, is available at <http://.nlnm.nlm.gov/partners/>.

National Network of Libraries of Medicine: To contact the nearest office to inquire about IT training, call 1-800-338-7657. More information on the program is available at <http://www.nlnm.nlm.nih.gov/>.

Authors

Neil Rambo, M.L.S., is associate director, National Network of Libraries of Medicine, Pacific Northwest Region, based at the UW Health Sciences Libraries.

Sherrilynne Fuller, Ph.D., is head, Division of Biomedical and Health Informatics of the Department of Medical Education in the UW School of Medicine, and director, Health Sciences Libraries.

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Box 354809, Seattle, Washington 98195-4809
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