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Using the Internet for Data Collection in Nursing Research

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This article examines how the Internet may be used as a tool for data collection in nursing research. An overview of the demographic composition of the Internet population is outlined and discussed as a constraint on the type of research that can be undertaken using the Internet. Methods of data collection such as e-mail and WWW questionnaires are discussed as well as the possibility of virtual focus groups. Some of the difficulties and advantages that may confront the researcher wishing to undertake research using the Internet are outlined.
Key words: Nursing, Research, Internet, E-mail.

Nurses have established a presence on the Internet through e-mail discussion groups such as Nursenet (see http://www.ualberta.ca/~jrnorris/nursenet/nn.html), newsgroups such as sci.med.nursing and on-line journals such as *The American Journal of Nursing* (see http://www.ajn.org). Nurses have been quick to point out the potential of electronic networks for enhancing collaboration in international research[1,2] and have published guides to nursing resources on the Internet.[3,4] However, it has been only relatively recently that nurses have begun to use the Internet as a data collection tool in formalized research.[5-8] This article describes how the Internet can be used as such a tool and some of the advantages and disadvantages of Internet data collection.

DEMOGRAPHICS OF THE INTERNET: THE ULTIMATE CONVENIENCE SAMPLE?

A recent radio advertisement for an Internet provider service claimed there are 97 million Internet users worldwide. More conservative estimates put the figure at around 40 million. There were between 6 million[9] and 10 million[10] Internet users in the United States at the beginning of 1996. Whatever the number, it is huge and by all accounts growing exponentially, as illustrated in Figure 1.

It would be incorrect to assume that the staggering number of Internet users worldwide provide a representative sample of the world population accessible to the would-be researcher. Georgia Tech Graphics Visualization and Usability Centre[11] surveyed 15,000 WWW users, using nonprobabilistic sampling that they claim provides an "interesting and widely respected 'snapshot' of who's using the giant computer network." The majority of Internet users are likely to be found in the United States or Northern Europe. Consistent with other survey results[10] only one third are women, who are more likely than men to use the Internet at work and at academic locations. The average age of the Internet user is 34.9 years. Most Internet users work in the computer industry, education, management, or other "professional" occupational group and enjoy an average household income of $60,800 (US). Other US surveys support the profile of the typical Internet user as being young, male, white, educated, and wealthy.

English appears to be the dominant language on the WWW, which is the fastest growing Internet application. This is not surprising given that the Internet was developed in the United States, which also boasts sales of 20 million PCs each year. Baran[12] points out that the Internet, like most new technologies is used primarily by industrialized countries (Fig. 2). Nearly 50 countries have fewer than one telephone line per 100 people and in China a $2000 computer costs four times the average workers annual wage.[12] For most of the world's population, driving on the "information super highway" or participation in a virtual "global village" is an impossibility.

The demographic composition of Internet users may be a constraining factor for the Internet researcher. For example, a study on the experience of poverty would be a challenging undertaking using the Internet. This aside, the profile of the typical Internet user belies the incredible diversity of interests, experience, values, and beliefs of those who use the Internet. This is partly because many surveys are commissioned by companies wishing to cash in on the projected $2.5 billion of transactions[13] to be made over the Internet in 1998. Their interest is to
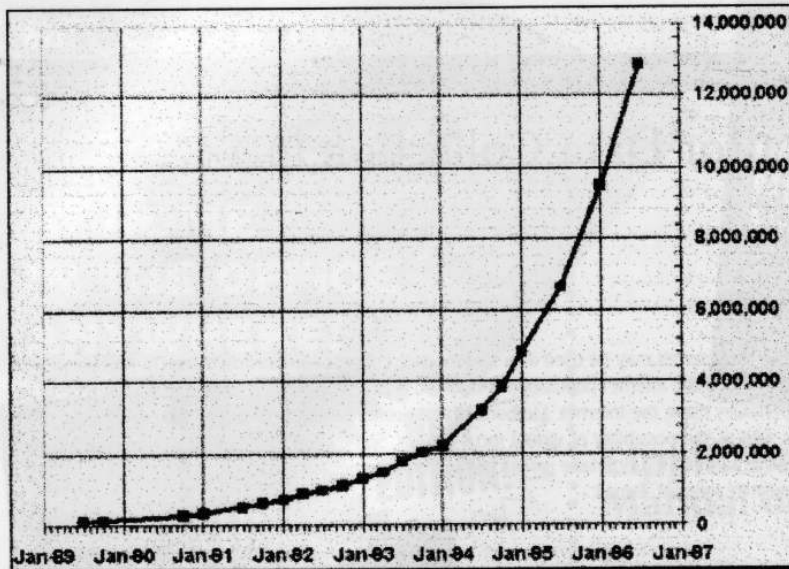
FIGURE 1
Growth in Internet hosts: January 1989 to January 1997. Source: Rutkowski.[14] A host is a computer through which users connect to the Internet.

identify users of the WWW for niche marketing purposes. However, many people use the Internet almost exclusively for e-mail and do not have access to the bells and whistles that accompany the WWW. The challenge for the researcher is to identify and access potential research participants on the Internet.

FINDING RESEARCH PARTICIPANTS: WHERE DO PEOPLE CONGREGATE?

Newsgroups are forums where people with particular interests can post public messages much like a bulletin board. Others can respond to the poster directly through e-mail or continue the "thread" of the conversation publicly. Many thousands of newsgroups exist on topics as diverse as the molecular biology of zebra fish, to support for people with arthritis. Newsgroups are a convenient and inexpensive way to network with people who share similar interests. Even a text-only computer with appropriate software can access them. Table 1 lists a small number of health science, health care, and health-related newsgroups.

E-mail is the most universal of Internet applications. If a researcher knows the e-mail addresses of potential research participants, then it is easy to make contact. However, e-mail addresses are not so easy to find and few people appreciate receiving unsolicited e-mail. E-mail mailing lists provide a convenient means of networking. These are "semi-public" in that a person interested in a list topic must send a message request to subscribe. Some list groups are closed (that is, available only to people with certain qualifications) whereas others are moderated by "list owners" who are responsible for the administration of the list. A

message sent to the list will be sent automatically to all other members of the list and others can respond to the message directly by e-mail or reply to the list. Table 2 lists some of the currently available nursing e-mail lists. These are used frequently to request assistance with research, share preliminary findings, and promote conferences. Like the Internet newsgroups there are a raft of e-mail lists on topics related to various specific health problems and disability issues.

World Wide Web pages focusing on special interest areas frequently provide guest books or contact books where people can post details about themselves and invite contact from other people. Some also offer the immediacy of live chatting facilities with others (eg, *The American Journal of Nursing*). Real-time chatting using Internet relay chat (IRC) or one of the newer voice, video, or text chatting software packages such as PowWow, Iphone, or Cool Talk have greater immediacy than e-mail but the requirements of a fast Internet connection and fast computer considerably limit the potential number of participants.

RECRUITING RESEARCH PARTICIPANTS

Once identifying where potential research participants might be found it is necessary to engage with them. Some newsgroups and e-mail lists have rules relating to posting surveys and questionnaires to the group. Many people pay for messages that they receive and some consider receiving research questionnaires as akin to paying for unsolicited junk mail. Unless the researcher has only a small number of questions to ask, it is preferable to post a precis of the research proposal, an outline of how the results
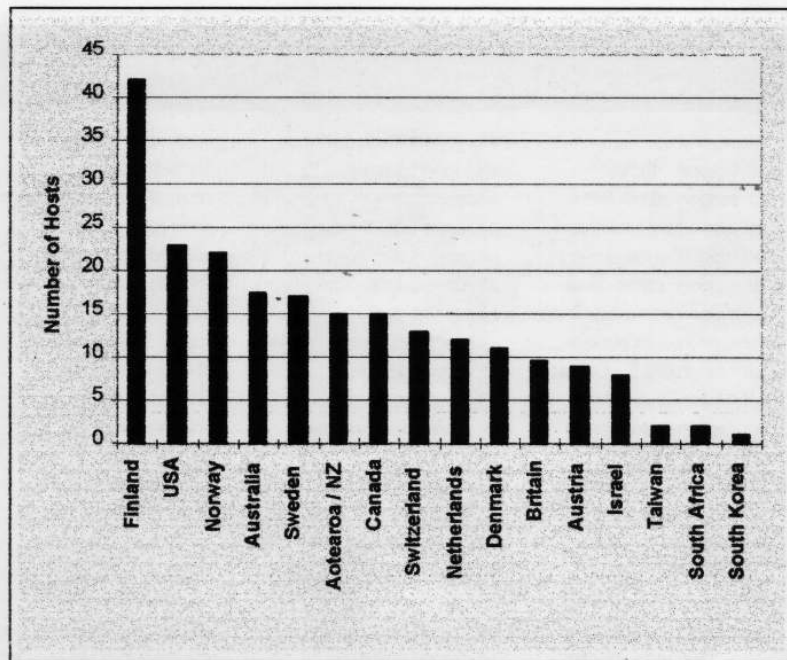
FIGURE 2
Top Internet countries: Hosts per 100,000 population (January 1996). Source: Baran.[12]

will be used and an invitation to participate. Information about where individuals can obtain more information, for example the researchers e-mail address or WWW page, also should be provided.

It is possible and relatively easy to send copies of messages to almost every newsgroup or e-mail list on the Internet. Although the idea of reaching an audience of millions may sound enticing, it is a practice that ought to be avoided as it can cause ill-feeling among people who may encounter the message numerous times and is considered a breach of "netiquette." The research ought to have relevance to the list or group members.

The WWW is another useful way to recruit participants. If a research project relates to the content of a WWW page most page administrators are happy to include links to the proposal or even questionnaires. Fawcett and Buhle[6] placed the Cancer Survivors Survey Questionnaire on the OncoLink WWW and gopher server (http://oncolink.upenn.edu/) as well as posting it to Compuserve's Cancer Forum and the newsgroup alt.support.cancer.

DATA COLLECTION

The most common method of collecting data via the Internet is through questionnaires.[7] Structured, closed questions lend themselves to quantitative analysis. Questionnaires can be posted readily to newsgroups, e-mail lists, directly to participants or placed ready for download at File Transfer Protocol, WWW, or gopher sites.

Given that there will be considerable variation in e-mail software that participants may be using, as well as differing levels of expertise in using the software questions ought to be brief and unambiguous. Questions requiring a mark-the-box response, for example "Please indicate your sex: Male [ ] or Female [ ]," may be particularly difficult or impossible for some respondents to complete. Questions that allow free text entry are preferable because they allow for a wider variation of responses. It was this author's experience[5] that responses to e-mail questionnaires came in many forms. Some people quoted from the original message, others merely numbered the question and provided a response, and others responded in an essay type format.

A questionnaire embedded in a WWW page is easier for a participant to complete. Responses to questions can be limited to predetermined options or free text entry. Figure 3 illustrates part of a WWW form, with which the participants are able to choose options from a number of categories. On completing the questionnaire a participant merely has to click on a "submit" button and the response can be e-mailed directly to the researcher or processed by an analysis program. A WWW questionnaire has the advantage of allowing more anonymous responses, whereas it is relatively easy to identify recipients of e-mail responses by their e-mail address. The disadvantage of WWW questionnaires is that they require at least a knowledge of hypertext mark-up language (the language required to format WWW documents) and usually another

TABLE 1
A Selection of Health and Disability News Groups

alt.support	alt.support.abuse-partners	sci.med.cardiology	alt.support.breastfeeding
alt.support.arthritis	alt.support.asthma	sci.med.diseases.cancer	alt.support.cancer.prostate
alt.support.attn-deficit	alt.support.cancer	sci.med.diseases.osteoporosis	alt.support.chronic-pain
alt.support.breast-implant	alt.support.childfree	sci.med.nutrition	alt.support.dev-delays
alt.support.cerebral-palsy	alt.support.depression	sci.med.orthopedics	alt.support.dissociation
alt.support.crohns-colitis	alt.support.depression.seasonal	sci.med.prostate.prostatitis	alt.support.dystonia
alt.support.depression.manic	alt.support.diet	sci.med.vision	alt.support.epilepsy
alt.support.diabetes.kids	alt.support.disabled.sexuality	sci.psychology.research	alt.support.hemophilia
alt.support.disabled.artists	alt.support.dwarfism	soc.support.depression.crisis	alt.support.loneliness
alt.support.divorce	alt.support.endometriosis	sci.med.immunology	alt.support.menopause
alt.support.eating-disord	alt.support.food-allergies	sci.med.midwifery	alt.support.myasthe-gravis
alt.support.ex-cult	alt.support.grief	sci.med.obgyn	alt.support.obesity
alt.support.glaucoma	alt.support.hearing-loss	sci.med.pathology	alt.support.prostate.prostatis
alt.support.headaches.	alt.support.househusbands	sci.med.prostate.bph	alt.support.short
migraine	alt.support.jaw-disorders	sci.med.psychobiology	alt.support.sinusitis
alt.support.herpes	alt.support.learning-disab	sci.psychology.personality	alt.support.step-parents
alt.support.inter-cystitis	alt.support.marriage	sci.psychology.theory	alt.support.tinnitus
alt.support.kidney-failure	alt.support.musc-dystrophy	soc.support.depression.family	misc.health.diabetes
alt.support.mult-sclerosis	alt.support.post-polio	soc.support.pregnancy.loss	sci.med.informatics
alt.support.ocd	alt.support.schizophrenia	soc.women	sci.med.nursing
alt.support.ostomy	alt.support.single-parents	soc.women.lesbian-and-bi	sci.med.occupational
alt.support.personality	alt.support.spina-bifida	soc.support.youth.gay-lesbian-bi	sci.med.prostate.cancer
alt.support.psoriasis	alt.support.stuttering	soc.support.transgendered	sci.psychology.
alt.support.sleep-disorder	alt.support.turner-syndrom	soc.support.fat-acceptance	psychotherapy
alt.support.stop-smoking	misc.health.arthritis	soc.support.loneliness	sci.research
alt.support.tall	misc.health.injuries.rsi.misc	soc.support.depression.seasonal	soc.support.depression.
alt.support.tourette	sci.med	soc.support.depression.misc	manic
misc.health.alternative	sci.med.diseases.hepatitis	alt.support.anxiety-panic	soc.support.depression.
misc.health.infertility	misc.health.therapy.occupational	alt.support.ataxia	treatment

programming language to write the scripts to process the completed forms.

DISADVANTAGES OF USING THE INTERNET FOR DATA COLLECTION

People who use the Internet will inevitably have certain characteristics. At the very least, the pool of people potentially available for the researcher to interact with directly will be limited to those who possess:

1. Sufficient education to be able to read and express themselves in written form;
2. The ability to operate a computer and associated software;
3. The financial resources necessary to maintain an Internet account or access through an institution such as place of work, school, or hospital;
4. Physical access to the Internet, for example, a reliable telephone line;
5. The inclination to use the Internet and participate in research.

Any of these factors may act as barriers to people's involvement with the Internet and limit the scope of potential research topics. As Fawcett and Buhle[6] acknowledge, "it is not currently possible to estimate the number of individuals with the particular health state of interest who have access to computers and the Internet."

There often is a low response rate to on-line surveys. In the research I undertook in 1996, I received 37 responses from questionnaires posted to two e-mail lists and one newsgroup. All but two of the responses were from the mailbase psychiatric nursing list, which at the time had approximately 250 members. Murray[7] posted his research questions to the e-mail mailing list Nursenet, which had many more members but from which he had a similar response rate. It may be that different mailing lists are more receptive to research participation. A participant in my research outlines how she received 170 responses to a question she posed to an e-mail list offering her support, encouragement, and advice. This highlights that

TABLE 2
A Sample of Nursing E-mail List Groups*

List Name	List server Address	List description
CAREPL-L	LISTSERV@LISTSERV.NET	Nursing Care plans
GLOBALRN	LISTSERV@LISTSERV.NET	Culture and health
EYENURSE	maiser@mailgw.ornet.med.umich.edu	Discussion list for opthalmic nurses
GRADNRSE	LISTSERV@LISTSERV.NET	Questions and Answers About Nursing Practice Problems
ivtherapy-1	LISTSERV@netcom.com	Discussion on IV therapy
NRSINGED	LISTSERV@LISTSERV.NET	Nursing Educators discussion
NSGINF-L	LISTSERV@LISTSERV.NET	Nursing Informatics
NURSENET	LISTSERV@LISTSERV.NET	A Global Forum for Nursing Issues
NURSERES	LISTSERV@LISTSERV.NET	Discussion list for nurse researchers
psychiatric-nursing	mailbase@mailbase.ac.uk	Psychiatric nursing issues. N.B. Send the commands: Join psychiatric-nursing firstname(s) lastname substituting your own name.
SCHLRN-L	LISTSERV@LISTSERV.NET	School Nurse Network
SNURSE-L	LISTSERV@LISTSERV.NET	An International Nursing Student List

*To subscribe to a list send an e-mail message to the "list server address" and in the body of the message type: SUB *list name*. Replace *listname* with the name of the list you wish to join.

care should be taken in choosing newsgroups or lists to which the research is relevant and preparing a request of participation that is friendly and appealing to readers.

The dynamics of communicating via e-mail certainly are different from face-to-face or oral communication. Nonverbal cues that enhance the communication of emotion are more difficult to convey using text only. However, participants may convey emotions using symbols to embellish text such as those in Table 3 and many responses I received during my research were impressively expressive and articulate. Murray[7] argues that e-mail interviews may be at least as in-depth and flexible as face-to-face interviews, and like all interviews they depend on the rapport that is able to be established and the skill of the interviewer.

E-mail can paradoxically convey a sense of intimacy and anonymity, which can be liberating for many people who tend to disclose more intimate details or personal viewpoints than they would normally share in face-to-face encounters. Others may find talking using e-mail daunting and frightening and for this reason be unwilling to participate in research using the Internet.

ADVANTAGES OF USING THE INTERNET FOR DATA COLLECTION

The financial cost of using the Internet for data collection is small relative to most other methods. The costs of posting messages to e-mail lists or news-groups may be only a few cents compared with the hundreds of dollars required to mail questionnaires to a similar number of people or field researchers to interview them directly. The data collected does not require transcription, saving additional costs. After the short and simple process of deleting unwanted symbols and quotes from the returned responses the data can be imported immediately into a qualitative analysis software program.

Rather than single responses to questions the researcher may desire to interview participants.

FIGURE 3
An example of World Wide Web survey. Source: http://cancer.med.upenn.edu/.

TABLE 3
Some Symbols and Abbreviations Used in E-mail to Help Convey a Message

The basic smiley:

:-) or :)	Happy
:-(or :(	Sad
;-)	Wink

Variations on the smiley:

8-)	I see!
:'-(or :'-)	Tears of sadness or joy.
%-) or %-(	Confused or drunk
:-o or :-O	Shock or shouting (Can also be conveyed by typing in Capitals)
:-] or :-}	Sarcasm or smugness
:-/ :-\ or :-|	Mixed Feelings
:-{} :-(>) :-{}	Some variations

Abbreviations used in e-mail to help convey a message:

BTW	By the way
IMHO	In my humble opinion
IMNSHO	In my not so humble opinion
IOW	In other words
LOL	Laughing out loud
ROTFL	Rolling on the floor laughing
ROTFM	Rolling on the floor moaning
<g> or <G>	Grin

Source: Lakeman, 1996.

The Internet currently provides a number of ways to achieve this end. E-mail provides the most accessible means to dialogue with research participants. Murray[7] described how in his research using e-mail, after starting interviews with structured questions, the interviews became progressively unstructured and varying in content depending on the interviewees' interests. E-mail offers the opportunity to clarify points and build a relationship with another in a similar way to a telephone conversation. Alternatively, after initial contact and consent is negotiated and depending on the hardware and software available to the researcher and participant interviews might be undertaken using Internet voice chatting, video conferencing, or real-time text chatting facilities. Many applications allow group chatting and shared white boards so "virtual focus groups" are quite feasible.

Using the Internet for data collection will save time. After preparing the research questions it took only a few seconds to post them to the appropriate e-mail lists and all my responses were received within a 2-week period.[5] Fawcett and Buhle[6] suggest that an electronic survey is an expedient method of collecting preliminary or pilot study data required by funding agencies to demonstrate the feasibility of larger scale studies.

Data collection using the Internet has advantages for research participants in that they are able to respond to questions at their convenience and also access and comment on the research findings with ease. Geography provides no barrier to participation, therefore allowing people to participate in research hosted from another country. Those that require time to reflect on questions are able to do so without pressure. For the researcher demand characteristics or expectancy effects are likely to be minimized.

CONCLUSION

The Internet provides an easy, inexpensive, and expedient method of data collection for either qualitative or quantitative data analysis. The scope of research that might be undertaken is limited by the demographic composition of Internet users. This article has discussed using e-mail questionnaires, e-mail interviews, or WWW surveys to gather data. E-mail list groups and Internet newsgroups currently are the most effective means of targeting potential research participants. Clearly, the Internet may provide other benefits to the researcher, such as searching on-line databases, on-line journals, dissemination of findings, and facilitating international collaboration on research projects.

The Internet is changing and growing at a phenomenal pace. As technology becomes more accessible to people the Internet will increasingly be used for data collection in research. In time it is likely that e-mail in its current form will be superseded by Internet voice or video mail bringing new challenges and opportunities to researchers. In the meantime, the Internet provides a wealth of opportunity for novice and expert researches to further understanding and develop knowledge in their fields of interest.

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