Invited Commentary

Invited Commentary: Topical Threats to Epidemiology

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Received for publication July 19, 2007; accepted for publication September 21, 2007.

Epidemiologic studies are subject to social and cultural influences, which can influence the way samples are identified or included and information is collected. In this commentary, the author highlights issues related to several factors that may influence current research methods, such as changes in telephone use and new ethical guidelines. Technologic developments that have the potential to provide new opportunities for sample selection and data collection are also outlined. Epidemiologists need to be flexible and responsive to changes that may influence their research methods and should use their training and judgment to assess the likely impact of any potential biases or influences, so that study quality is maintained.
topics: bias (epidemiology); cellular phone; data collection; epidemiologic methods; Internet; research design; sampling studies; technology

One essential criterion for the conduct of epidemiologic studies is the identification of an appropriate sample. In surveys aiming to estimate the general population prevalence of health conditions and exposures, investigators rely on the identification of an unbiased sampling frame and the agreement of people invited to actually take part in the study. In studies estimating trends over time, the sample also needs to be stable or reproducible, so that any trends can be attributed to real change rather than variations in the sample. Such methods, however, are susceptible to societal changes, and we need to be creative and flexible in response to technologic and ethical challenges to epidemiologic orthodoxy.

Sampling frames have always differed according to the social and cultural norms of a specific time or place; population registers, family practice registers, and health maintenance organization registers are all considered to provide access to representative samples of the population in different countries. In situations where the majority of households have a land-based telephone line, random digit dialing has been used as a standard method of identifying a representative sample of households from which a valid sample of individuals can be obtained. This method has been used for over 30 years in the United States, where even in 1976, 94 percent of households had telephones (1); however, it is less common in some other countries because of (perceived or actual) lower proportions of households with telephones. Although biases have been identified, such as sociodemographic differences between households with listed and unlisted telephone numbers (2), stratification of recruitment according to these characteristics can minimize their effects.

The paper by Delnevo et al. (3) in the current issue of the Journal raises the likelihood of a relatively new threat to this sampling method—the substantial reduction in households with a land-based telephone line in conjunction with an increase in the use of cell phones. The authors show that a US survey using random digit dialing may have underestimated the prevalence of risky health behaviors, leading to an apparent but probably spurious declining trend. This is a good example of a situation where epidemiologists need to use their training and experience to question patterns such as trends over time. This threat to the usefulness of random digit dialing may be particularly pertinent for younger...
populations, for whom cell-phone use is likely to be higher and to continue increasing. Although oversampling of underrepresented groups can enable prevalence figures to be standardized, if there is substantial undercoverage, this is likely to be unsatisfactory.

Other threats to telephone-based surveys may be more apparent in different populations. Call barring (where people can automatically screen or reject telephone calls without caller identification) is a service introduced fairly recently and is likely to restrict surveys carried out through call centers. Legislation has also led to the establishment of registers for people wishing to opt out of unsolicited telephone calls (e.g., the Telephone Preference Service in the United Kingdom (http://www.tpsonline.org.uk) or the Do-Not-Call Registry in the United States (https://www.donotcall.gov/) (4)), and while these registers are predominantly aimed at preventing commercial telephone calls, they may prove to be further threats to surveys carried out over the telephone. The main implication of these features is the potential for obtaining biased samples. The paper by Delnevo et al. (3) implies that random digit dialing might produce a biased sample of younger people, but there has been little work exploring the types of biases that might be present with respect to these other issues.

In addition to these challenges to the identification of representative samples, there have been legal and regulatory changes that affect the consent processes required to recruit participants into a study (e.g., the Health Insurance Portability and Accountability Act of 1996 in the United States (5) or the Governance Arrangements for NHS Research Ethics Committees in the United Kingdom (6)). Such legislation commonly means that explicit consent is required to contact people, to access their medical records, and to follow them up as part of a study. Research has been carried out on this issue, and a range of factors have been identified as being associated with giving consent either for study participation or for medical or occupational record linkage (7–10). The implications of this are twofold: Larger initial sample sizes are needed to ensure that the sample is large enough after use of the consent procedures, and the possibility of consent bias needs to be addressed.

These issues have the potential to influence many surveys of the general population and to have an impact on epidemiologic research. However, other societal changes may improve our ability to carry out such research. The Internet and the World Wide Web are likely to change the way that data are collected in future epidemiologic surveys. At present, identification of representative samples of people with access to the Internet is problematic in some settings (e.g., older people, deprived populations, illiterate populations), but in settings where there is institutional access to the Internet—occupational settings, for example—Web-based surveys can provide an inexpensive, fast, and efficient method of data collection (11). Increasing cell phone usage may also provide another arena for efficient data collection. Text-based reminders (also known as Short Message Service or text messaging) on cell phones are currently being used in some studies, and research indicates that this technique is broadly acceptable and efficient, particularly for longitudinal studies (12, 13). The use of this method is likely to increase as both improving technology makes it easier and the proportion of the population using cell phones increases.

Societal and technologic changes are not always a threat to epidemiology, but epidemiologists need to be more innovative in their methods and embrace new technology wherever possible. One caveat to this may be the ethical challenges involved, since what some people may see as technologic solutions others may see as threats to individual freedom. These issues must also be taken into account.

Studies such as that by Delnevo et al. (3) demonstrate why keeping abreast of social changes and having the capacity and creativity to adapt to them is crucial in the design and interpretation of epidemiologic studies. The skill of the epidemiologist is paramount in making judgments about the likely impact of any potential biases or influences on the ways that participants are recruited into a study. We need to continue to be questioning, flexible, and creative in our research methods.

ACKNOWLEDGMENTS
Conflict of interest: None declared.

REFERENCES

