

The impact of cell phones on public health surveillance

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Random-digit-dial telephone sampling of households with landline telephones has been a popular tool for conducting surveys of the population in the United States of America (USA) in the past several decades. These surveys have provided a cost-efficient strategy for conducting population-based surveys, have sound sampling characteristics and have benefited from high coverage of landline telephones reaching more than 90% of American households from 1970 to 2004.¹ However, in the past 10 years the utility of random-digit-dial telephone surveys is being questioned due to another trend in telephone usage – the increased popularity of cell (mobile or portable) phones. More and more telephone users are switching from landline telephones to cell phones, reducing the number of households with landline telephones and, therefore, lowering the coverage of traditional random-digit-dial surveys that don't include cell phone numbers.

This highlights a growing concern that traditional telephone surveys, such as the Behavioural Risk Factor Surveillance System surveys conducted by the Centers for Disease Control and Prevention in the USA, exclude adults living in cell-phone-only households (households with no landline telephone).^{1,2} Indeed, the percentage of American adults who live in cell-phone-only households increased by more than 700% between early 2003 (2.9%) and late 2009 (24.5%).^{1,3} Existing indicators suggest that this pattern of adoption of wireless-only communication will continue.¹⁻³ Specific subpopulations, such as renters, males, minorities and persons living at or near the poverty line, are more likely to live in cell-phone-only households, and wireless substitution is particularly high among young adults (persons aged 18–34 years).¹⁻³

With the rapid growth in the size of the cell-phone-only population in the USA and its continued concentration among younger people, health surveillance systems that use telephone survey methods are facing a challenge in obtaining high-quality data from younger adults because landline-based estimates of certain characteristics and behaviours are biased by the absence of the cell-phone-only population.

Sampling and interviewing respondents by cell phone is now a necessity if telephone surveys are to provide valid, reliable and representative data.

Penetration rates for the cell-phone market in the USA are greater than 75%, and in Hong Kong Special Administrative Region (China), Japan and western Europe penetration has already exceeded 100% (multiple cell phones per subscriber).⁴ Seventy-five percent of the 4 billion cell phones currently in use worldwide are in developing countries and, within the next decade, there will be more cell phone subscriptions in the world than people.⁵

Random-digit-dial telephone sampling of persons or households with cell telephone numbers has the potential to be a powerful tool for conducting population-based public health surveillance in developing countries. Due to the high cost of connecting individual houses to phone lines, many developing countries simply bypassed full landline phone services and have leapfrogged to a wide cellular phone network.⁶ Villages that for centuries were cut off from regular communication with the outside world or limited to passive receipt of information via radio broadcast are now linked to each other and to the wider world through instantaneous, low-cost mobile technology. Mobile phone connectivity in developing countries facilitates social and economic development through increased access to people, information and services such as health care, education, employment opportunities and market information. In developing countries, which lack the physical and technical infrastructure present in more developed nations, cell phone surveys provide an inexpensive and feasible way to conduct population-based data collection.

There are several obstacles to conducting cell phone surveys in developing countries. First, it is important to determine the coverage territory of the available mobile phone networks to make sure that cell phone service is available in all or most of the study area, including rural zones. Second, a good sampling frame for the target population is needed. In many developing countries, phone lines can be purchased without undergoing a formal registration process. If a sizable number of cell phones

are unregistered, then clearly their owners could not be sampled from registration lists. A complete sampling frame is necessary for any population-based survey that seeks to be representative at the household or individual level in developing countries. Third, one needs to be aware of the cost that cell phone subscribers pay to receive a call and potentially offer reimbursement for the time spent responding to the survey. Fourth, selection of one adult respondent from a sample household needs to consider the number of adults with cell phones in the household and whether people share cell phones. Fifth, one needs to determine if text messages rather than voice calls are the primary means of cell phone communication. In developing countries, health surveys have relied primarily on in-person (face-to-face) interviewing. Given the considerably lower cost of conducting telephone interviews, cell phone health surveys may come into wider use if the above issues can be addressed. ■

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