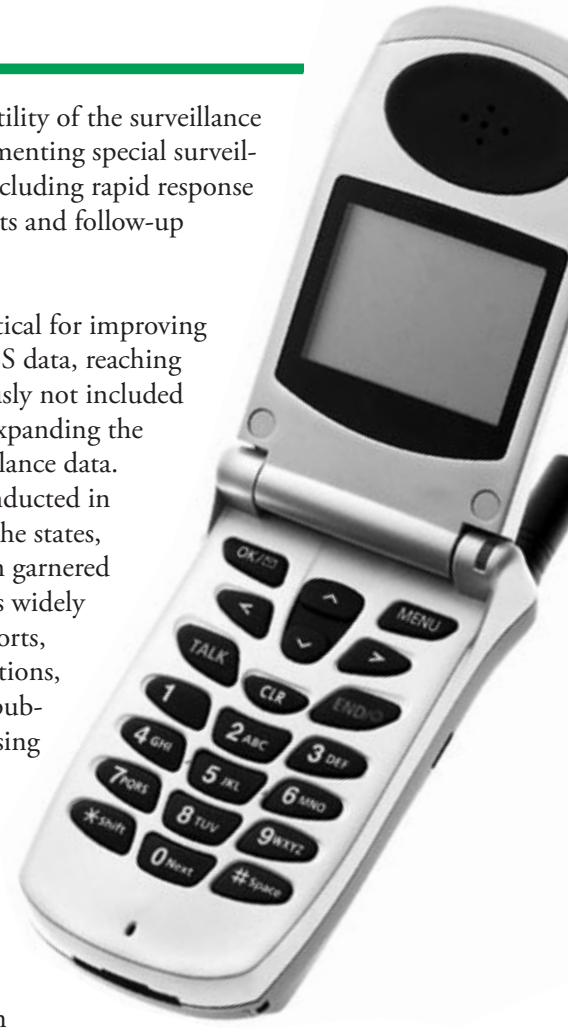
Improvements to the Behavioral Risk Factor Surveillance System (BRFSS) Methodology, Design, and Implementation

Background

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of health surveys that was established in 1984 by CDC and state health departments. These surveys obtain information about health risk behaviors, clinical preventive health practices, and health care access, primarily related to chronic disease and injury, from a representative sample of adults in each state. For the majority of states, BRFSS is the only source for this type of information. Data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands. Approximately 350,000 adult interviews are completed each year, making BRFSS the largest health survey conducted by telephone in the world.

The challenge for BRFSS is effectively managing an increasingly complex surveillance system that serves the needs of multiple programs while adapting to changes in communications technology (increased use of cellular telephones and call screening devices), societal behaviors (concerns about privacy and declining participation in surveys), and population diversity (growing number of languages spoken in the United States along with greater cultural and ethnic diversity). To address these challenges, BRFSS maintains an ongoing program of improvement and adaptation that involves

- Designing and conducting innovative pilot studies to improve the current BRFSS methodology and provide a foundation for the implementation of future methodologies.
- Identifying and addressing potential threats to the validity and reliability of BRFSS data that might affect survey participation and data quality.
- Expanding the utility of the surveillance system by implementing special surveillance projects, including rapid response surveillance efforts and follow-up surveys.



These efforts are critical for improving the quality of BRFSS data, reaching populations previously not included in the survey, and expanding the utility of the surveillance data. Pilot studies are conducted in collaboration with the states, and the information garnered from these studies is widely disseminated in reports, conference presentations, and peer-reviewed publications. By addressing current challenges and keeping an eye on future issues, these studies help prepare the surveillance system for design and implementation changes when needed. In this way, the BRFSS team ensures that public health surveillance efforts meet the highest scientific standards, use the most effective and cost-efficient approaches, and produce valid and reliable data and results.

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BRFSS Expert Panel Meetings

Guidance on system improvements comes from a variety of sources, including state partners, other CDC Centers and Programs, and other outside experts in the fields of survey research, statistics, and epidemiology. In 2002, BRFSS held its first biannual BRFSS Expert Panel Meeting, inviting approximately 20 survey statisticians, methodologists, and operational experts to a 2-day meeting to discuss the challenges facing the field of survey research and implications for the BRFSS. Repeated in 2004 and 2006, the goal of these meetings is to develop options and prioritize recommendations for maintaining data quality in the face of societal and technological changes.

At the most recent meeting in November 2006, the panel made a number of specific recommendations, including using advance letters by all states, conducting pilot studies with cellular telephone users, and identifying the appropriate mix of sampling frames and survey modes to maintain the validity of BRFSS estimates. These and other recommendations made by the panels are critical for improving BRFSS, ensuring the quality and validity of the data, and reducing the potential for bias in BRFSS estimates.

Overview and Outcomes of Selected Projects

Based in part on recommendations from the Expert Panel Meetings, BRFSS has undertaken a number of innovative and informative pilot studies and analyses, including the following:

Use of prenotification letters and messages on answering machines. Advance letters can improve participation in telephone surveys like BRFSS. When tested in a number of states, letters improved response rates, on average, 6 percentage points. The letters were also cost efficient in that the cost of obtaining a fixed number of completed surveys using advance letters was lower than the cost without letters. As a result, advance letters are recommended for use with the BRFSS in all states. Messages left on the answering machines of potential respondents did not, however, improve response rates significantly. This is likely due to the relatively small percentage of sample members who remembered hearing the message and who found the message to be effective in persuading them to participate in the survey.

Assessing the impact of the Do Not Call Registry. More than 100 million telephone numbers have been listed on the National Do Not Call (DNC) Registry since it began in 2003. To assess the potential impact of the registry on participation rates in BRFSS, case outcomes were examined from nearly 4.5 million telephone numbers called between January 1, 2002, and June 30, 2005. Using trend analyses and time series modeling, the findings indicated that once pre-DNC Registry trends in response rates and other potential covariates were accounted for, the do-not-call rules appeared to have had no significant impact on state-level response rates in either a positive or negative direction.

Use of real-time telephone survey interpreters. Real-time interpretation during a survey can expand the number of languages in which surveys are offered. A detailed assessment of the quality of this approach was conducted as part of the BRFSS in California using behavior coding of interviews conducted with respondents who otherwise would have been finalized as "language barrier nonrespondents." Interviews were recorded and behavior coded, quantifying for each question (1) the accuracy of the question interpretation, (2) the accuracy of the interpreted response, (3) the degree of difficulty administering the question, (4) the number of times the question was repeated, and (5) the number of times the interpreter and respondent engaged in conversation that was not relayed to the interviewer. The approach produced favorable results, with less than a 4% error rate for interpretation of the questions and a 1% error rate in interpretation of survey responses.

Use of Web and mail questionnaires. Web and mail versions of the BRFSS questionnaire were administered to potential respondents drawn from the standard BRFSS telephone sampling frame and reverse-matched to identify valid mailing addresses. Telephone survey follow-up was conducted with Web and mail survey nonrespondents. The findings suggest that self-administered modes, when used in conjunction with telephone follow-up, can improve levels of participation but may also increase differences between respondents and nonrespondents on certain measures of interest, such as respondent demographic characteristics and key health and risk measures.

Use of address-based sampling (ABS). Advances in electronic record keeping have allowed researchers to develop and sample from a frame of addresses, which appears to provide coverage that rivals that obtained through random-digit-dial (RDD) sampling methods. A pilot study conducted in 2005 compared use of traditional RDD telephone survey methodology to an approach using a mail version of the questionnaire completed by a random sample of households drawn from an address-based frame. The findings indicate that the mail survey approach can achieve higher response rates in low-response-rate states (< 40%) than RDD (particularly when two mailings are sent). Additionally, the address frame with mail survey design provides access to households with cellular telephones only and offers cost savings over the telephone approach.

Improving the current BRFSS weighting methodology. Post-survey adjustments are becoming an increasingly important means of maintaining the representativeness of survey data. Using statistical raking techniques, the approach to weighting BRFSS data is being re-evaluated. The new approach adjusts the data not only in terms of respondents' sex and age, but also race (in a more consistent manner), education, marital status, and telephone coverage—variables all found to be significantly related to key health and risk outcomes on BRFSS.

Current and Future Pilot Studies

Health surveillance in the future will be much more complex and involve multiple ways of collecting public health data. Although telephone surveys will likely remain the mainstay of how BRFSS data are collected, it is likely that some additional modes of interviewing will also be necessary. To prepare for this future, BRFSS currently has major pilot studies under way in the following areas:

Mixed-mode survey approaches. Studies of mixed-mode surveys involving mail surveys with telephone follow-up are under way, comparing samples of telephone numbers drawn using RDD methods to a sample of addresses drawn using U.S. Postal Service records. The study is being conducted in California, Florida, Massachusetts, Minnesota, South Carolina, and Texas.

Surveying cellular telephone users. To meet the challenge posed by the growing number of cellular-telephone-only households, BRFSS is conducting interviews with individuals sampled from known cellular telephone exchanges. Conducted in Georgia, New Mexico, and Pennsylvania, the study will help determine the feasibility of conducting BRFSS interviews by cellular telephone, their cost, and the impact on survey estimates of including such interviews.

Obtaining physical measurements. BRFSS is piloting an approach for collection of direct health measures (e.g., height and weight, blood pressure, cholesterol) from a subset of respondents to the ongoing BRFSS surveys. The data collection will be used to adjust statewide data collected from the ongoing BRFSS survey, facilitate validation of key BRFSS interview questions, and assess the feasibility of collecting physical measure data on an ongoing basis.

System Enhancements

As a result of this ongoing improvement process, the BRFSS has been enhanced in a number of ways, including

- Significant improvement in the speed with which final year-end data are released.
- Development of innovative Web-based tools to improve transfer of and access to BRFSS data and reports.
- Launch of the Selected Metropolitan/Micropolitan Area Risk Trends (SMART) project, which uses BRFSS data to produce survey estimates for selected metropolitan and micropolitan statistical areas (MMSAs) with 500 or more respondents.
- Provision of tools for mapping of BRFSS data at the state and local levels.
- Linkage of BRFSS data to other external data sources, such as measure of environmental quality.
- Conduct of follow-up surveys, whereby persons with particular health conditions or risk factors are identified in BRFSS and reinterviewed to obtain more detailed information.
- Rapid response to emergency public health situations, providing decision makers with critical, actionable information as crises unfold, such as during the 2004–2005 influenza vaccine shortage and in the aftermath of the 2005 hurricanes.

Selected Publications

M. Link, A. Mokdad, D. Kulp, and A. Hylon. (2006). "Has the National Do Not Call Registry Helped or Hurt Survey Research Efforts?" *Public Opinion Quarterly* 70(5):794–805.

M. Link, M. Battaglia, M. Frankel, L. Osborn, and A. Mokdad. (2006). "Address-Based Versus Random-Digit Dialed Surveys: Comparison of Key Health and Risk Indicators." *American Journal of Epidemiology* 164: 1019–1025.

M. Link and M. Kresnow. (2006). "The Future of Random-Digit Dialed (RDD) for Injury and Violence Prevention Research." *American Journal of Preventive Medicine* 31:444–450.

M. Link and A. Mokdad. (2006). "Can Web and Mail Survey Modes Improve Participation in an RDD-based National Health Surveillance?" *Journal of Official Statistics* 22:293–312.

M. Link, A. Mokdad, H. Stackhouse, and N. Flowers. (2006). "Race, Ethnicity, and Linguistic Isolation as Determinants of Participation in Public Health Surveillance Surveys." *Preventing Chronic Disease* [serial online] 2006 Jan. Available at: http://www.cdc.gov/pcd/issues/2006/jan/05_0055.htm.

H. Jia, M. Link, P. Levy, L. Li, J. Holt, and A. Mokdad. (2006). "Rapid-Response Health Surveillance Using Small Area Estimation Methods: Monitoring Vaccination Coverage During the 2004–05 Influenza Season." *American Journal of Preventive Medicine* 31(4):275–280.

M. Link and A. Mokdad. (2005). "Use of Prenotification Letters: An Assessment of Benefits, Costs, and Data Quality." *Public Opinion Quarterly* 69:572–587.

M. Link and A. Mokdad. (2005). "Use of Alternative Modes for Health Surveillance Surveys: Results from a Web/Mail/Telephone Experiment." *Epidemiology* 16:701–704.

M. Link and A. Mokdad. (2005). "Effects of Survey Mode on Self-Reports of Adult Alcohol Consumption: Comparison of Web, Mail, and Telephone." *Journal of Studies on Alcohol* 66(2):239–245.

M. Link and A. Mokdad. (2005). "Leaving Answering Machine Messages: Do They Increase Response Rates for the Behavioral Risk Factor Surveillance System?" *International Journal of Public Opinion Research* 17:239–250.

For more information or additional copies of this document, please contact the

Centers for Chronic Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
4770 Buford Highway NE, Mail Stop K-66
Atlanta, GA 30341-3717
Telephone: (770) 488-2455; Fax: (770) 488-8150
ccdinfo@cdc.gov
http://www.cdc.gov/brfss