

USES AND LIMITATIONS OF THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM DATA

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Introduction

The Behavioral Risk Factor Surveillance System (BRFSS) is a collaborative project of the Centers for Disease Control and Prevention (CDC), and U.S. states and territories. The BRFSS, administered and supported by the Behavioral Surveillance Branch (BSB) of the CDC, is an on-going data collection program designed to measure behavioral risk factors in adults 18 years of age or older. The objective of the BRFSS is to collect uniform, state-specific data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the adult population. Data are collected from a random sample of adults (one per household) in each state through a monthly telephone survey. Currently the BRFSS processes data and produces data sets and reports based on more than 135,000 completed interviews annually.

Field operations for the BRFSS are managed by state health departments under guidelines provided by the BSB. These health departments participate in the development of the survey instrument and conduct the interviews either in-house or through use of contractors. The data are transmitted to the National Center for Chronic Disease Prevention and Health Promotion's Behavioral Surveillance Branch at CDC for editing, processing, weighting, and analysis. An edited and weighted data file then returned to each participating health department for each year of data collection, along with summary reports of state-specific data prepared by BSB staff.

The BRFSS provides flexibility and timely data collection, and also provides a uniform, comprehensive way to monitor selected health behaviors. Items can be added each year to address newly identified health issues of concern to all areas, and state-specific questions can be added in a very short period of time during the year if needed. At the same time, standardization of core and module items allows health professionals to make state-to-state, regional, and other comparisons.

Data Use at the State Level

An important aspect of the BRFSS is how data are disseminated and utilized within states. Most data elicited from the BRFSS questionnaire are linked to specific objectives such as the Healthy People 2000 (HP2000) initiative, as assessment of progress towards meeting of

health objectives is commonly done by states. Such use of the BRFSS provides state policy makers with informed options for public health policy decisions. The many states uses for BRFSS include:

- Guidance for Health Policies
- Determine Priority Setting and Long Range Strategic Planning
- Monitor Progress towards Year 2000 Objectives
- Support Minority Health Program Initiatives
- Monitor Effectiveness of Prevention Programs
- State and Local Legislative Initiatives
- Needs Assessment and Documentation
- Point-in-Time Studies
- Provide State-Specific Prevalence Estimates
- Program Goal Monitoring
- Assist in Recommendations on Health Care Reform
- Guidance for Education Interventions
- Develop Community Surveys
- Increase Public Awareness
- Influence Physician Adherence to Guidelines
- Monitor and Evaluate Interventions
- Provide Data for State and Local Reports
- Provide Data for Funding Proposals
- Guide Resource Allocation
- Provide Models for Other State and Local Surveys

While use of the BRFSS for decision-making is central, it is not the exclusive function. Nearly all states prepare reports or fact sheets to educate the public, health professional community, and legislators about current status and trends in lifestyle patterns in their state.

How BRFSS data are used to address specific health issues varies by state. BRFSS data have been used to support tobacco control legislation in most states, and particularly, California. These data were influential in supporting the passage of Proposition 99 Tobacco Tax legislation, which generated millions of dollars in state funds to support health education and chronic disease prevention programs. In Oregon, the state health department used BRFSS state-added questions to evaluate the effect of the bicycle helmet legislation on safely helmet use. With passage of the National Breast and Cervical Cancer Mortality Prevention Act by Congress in 1990, funds became available to state health departments to establish breast and cervical cancer programs. Surveillance data on use of mammography and Pap tests from the BRFSS produce critical information to states

about baseline cancer screening levels and provide a means to monitor breast and cervical cancer control program impact.

Disseminating BRFSS findings within states is an important part of the surveillance system. As part of the cooperative agreement funding mechanism, CDC requires states to demonstrate how they have analyzed and disseminated BRFSS data. State-specific BRFSS data are also published in state medical journals (Heath) and in peer-reviewed scientific journals (Wingard).

Data Use by CDC Researchers

The task of analyzing data from the BRFSS and encouraging and promoting analysis of the data elsewhere rests primarily with researchers within CDC's Behavioral Surveillance Branch; however, researchers throughout CDC commonly analyze and publish findings from the BRFSS.

A few examples can be used to illustrate the analytic role and responsibilities at CDC. One common approach is to analyze health risk behavior prevalence patterns across all states, e.g., drinking and driving (Liu). Another type of analysis is to examine aggregated data. This type of analysis is exemplified by an examination of the prevalence of walking for physical activity (Siegel). A collaborative effort was undertaken among by staff in the Epidemiology and Analysis Section, another Center at CDC, and the Oregon Health Division to analyze BRFSS data from state-added questions (Nelson).

Data Use by Academic Researchers

Some of the work conducted by researchers outside of CDC has been on measurement properties of the BRFSS. Currently, more than 30 scientific publications on properties of selected BRFSS measures have been identified. Examples of recent studies of this type include comparison of BRFSS estimates for safety belt use with state observational surveys of safety belt use (Nelson, 1996); comparison of BRFSS state estimates for current smoking with estimates from the Census Bureau's Current Population Surveys (Arday, 1997); a South Carolina comparison of BRFSS estimates for hypertension with physiologic measures from the same population (Giles, 1995); and a comparison of estimates of self-perceived health status and chronic disease risk factors from a managed care member survey with those from the BRFSS (Cogswell, 1997). Most of these studies reported very high reliability and validity for BRFSS data.

Recently, several new studies have begun, including one focusing on the use of the BRFSS as a source for national estimates of selected health risk behaviors. This study, now in progress, compares estimates from BRFSS data with that from the National Health Interview Survey,

an in-person household survey.

Analysis of BRFSS data has increased as the scope of the survey and dissemination of the data have increased. The average number of publications in professional journals using BRFSS data increased from about 8 per year in the 1980s to 18 per year during the 1990s. A bibliography maintained by BSB contains 222 references for articles and reports published between 1982 and July 1998. These publications represent a mixture of aggregate and state-specific data analyses, epidemiologic studies focusing on the distribution of risk factors at a point in time, changes and trends over time, and area comparisons.

Caveats in Using BRFSS Data

Issues related to complex surveys

The BRFSS employs a complex survey design, and analysis of the data requires the use of analytic software that takes the characteristics of the design into account. Those characteristics, including unequal probability of selection, clustering of observations, stratification, and nonresponse, may result in inappropriate standard errors and confidence intervals, and misleading tests of significance when using standard statistical software packages which do not take these factors into account. Use of standard statistical packages with a weighting variable should yield the same point estimates as sample survey software packages, but the standard error of the estimated prevalence and other measures of variability are often underestimated. The extent of underestimation is related to the degree of intra-cluster correlation for variables being analyzed; the higher the intra-cluster correlation, the greater the underestimation of variability.

Limitations Common to Telephone Surveys

Coverage. Not all U.S. household have telephones. Currently, it is estimated that overall, about 5% of the population cannot be reached by telephone (GENESYS, 1997). The percentage of households with a telephone varies by region, state, and populations within a state. For example, telephone coverage is lower in the South (92%) than in other regions of the U.S. Coverage by states ranges from 87% to 98%. However, there is also variation by geographic areas within states and by population subgroups. For example, about 17% of Native American households are without telephones, compared with 15% of Black households, and 5% of White households. Since the BRFSS relies solely on telephone interviews, the potential exists for response bias due to undersampling of populations most likely to lack phone coverage. Although no direct adjustment is made for telephone coverage, post-stratification weighting adjusts for some

of the effects of noncoverage. Studies comparing estimated prevalence for persons with *versus* without telephones have been reported to be similar (e.g. Anderson, 1998).

Other protocol characteristics may exclude small portions of the total adult population. For example, the BRFSS excludes institutionalized individuals. Although this is a relatively small proportion overall, this exclusion may introduce more bias in some groups than others (i.e. the elderly, where an estimated 5% are institutionalized). The survey does not conduct proxy interviews, so that non-institutionalized individuals who are unable to respond to a telephone interviewer are also excluded. Finally, the BRFSS is administered in Spanish as well as English in many of the States that have large Hispanic populations, but people who speak only languages other than English and Spanish are excluded.

Self-reporting. There may also be some limitations on the reliability and validity of self-reported behaviors, with some overreported, and others underreported. However, in general studies that have looked at this issue with BRFSS data have generally reported high reliability and validity (see, for example, Jackson, Jatulis, Fortmann, 1992; or Bowlin, et al, 1996). A related issue shared by all anonymous telephone surveys is that self-reported data cannot be verified by physical measurement or visual means.

Response rates. Telephone surveys such as the BRFSS generally have higher refusal rates than those conducted in-person (Groves, 1979). Further, response rates may vary by demographic characteristics such as age and education, with elderly persons and those with lower educational attainment disproportionately refusing to be interviewed in telephone surveys (Groves and Lyberg, 1979).

Comparability issues specific to the BRFSS

Sample design. The BRFSS protocol specifies that the design must be a state-based probability sample in which all households with telephones have a chance of inclusion. It is unusual for states to not fully follow this protocol. When deviations occur, they generally stem from use of list-assisted samples where there are hundred blocks of telephone numbers with some specified minimum number of household numbers, (e.g. 3 or more) thus excluding "non-productive" parts of the telephone population.

Response rates. Response rates vary by state. For example, in 1997 the median CASRO rate was 63%, with a range of 46% to 87%. The CASRO rate apportsions dispositions with unknown eligibility status (ring, no answer and busy) to dispositions representing eligible respondents in the same proportion as exists among all calls of known status). However, some of the differences

in CASRO rates across states and data years may be due to demographic, cultural, or other characteristics of the state population; characteristics of the telephone systems; or sample designs. For example, other things being equal, states with telephone systems that contain larger percentages of nonworking and business numbers will have higher CASRO rates than states with telephone systems that contain smaller percentages of nonworking and business numbers. Among states using a Waksberg design, states in which residential telephone numbers tend to be assigned in hundred blocks will have higher CASRO rates than states in which residential numbers tend not to be assigned to hundred blocks. Among states using disproportional stratified samples, those using designs with relatively high zero-to-one-plus blocks ratios will have lower CASRO rates than those with relatively low zero-to-one-plus-block ratios.

Departure from core instrument. Wording change in the core instrument and/or changes in the population queried by states happen, but are rare. Wording changes are almost universally related to explanation of a procedure, but again occur rarely, and in only one participating area was there a change in the population queried. Specifically, the HIV/AIDS sections of the core and the mammography questions in the women's health section were affected by this practice for one state. A related practice involves insertion of some state-added questions in the core instrument. This type modification is also relatively rare, and states are required to clear such changes through BSB before implementing them.

Data collection. Data collection efforts may vary by state in terms of monitoring of interviews, collection mode (CATI, CASS, paper), etc. For example, only 30 states have interview monitoring capability, but all states recontact 5% of respondents for verification purposes. Although there are mixed collection modes, (27 areas use Ci3CATI, 4 use CASES, 8 use CASS, 10 use some other form of computer-assisted, and 3 use paper and pencil), almost half of the states use Ci3CATI programs that are coded by CDC. All states' data, regardless of collection method used, must pass through editing programs once the data is sent to CDC. The uniform review of data, while not eliminating differences, does make documentation of any differences possible.

Rare populations. Single year, state-specific analysis of rare conditions, small sub-populations, or small area estimates are usually not possible with BRFSS data. The sample size for most states is adequate for many analyses, but does not support detailed study of rare conditions such as diabetes, nor multivariate analysis of small subpopulations such as Native Americans. Even states with the largest sample size encounter problems in estimating county level prevalence of most risk factors. These challenges can be minimized through combination

of data across time or place.

BSB Programmatic Efforts to Facilitate Comparability

The cooperative CDC-State nature of BRFSS results in states having the ability to occasionally depart from agreed upon protocols for the BRFSS instrument and/or methodology in any given data collection year. However, BSB's oversight activities help facilitate standardization. For example, BSB compiles and publishes an extensive manual for conducting the BRFSS (CDC, 1998). This manual includes specifications for sampling methods, training of interviewers, interviewing procedures, sample management, call conversion, monitoring of interviews, verification callbacks, data management, and data submission. Numbered memoranda are issued to state coordinators as policy, procedures, or protocol are modified. BSB also coordinates core and module content and scripts interview lead-in for each questionnaire. BSB programs almost half of all questionnaires used by the reporting states, provides data layouts, editing criteria, and data submission requirements. All data files are reviewed and edited by BSB prior to inclusion in the aggregated BRFSS file, quality assurance measures are utilized, and all known exceptions or problems are described in the documentation package for a given data year. Finally, if departures are substantial, BSB may exclude data considered to be noncomparable from published reports and other sources, including the annual data files and CD-ROMS.

Conclusion

Like all data bases, the BRFSS has limitations which require thoughtful consideration on the part of analysts. However, as one of the largest on-going telephone surveys of health behaviors, and the only source of state-specific data on many health behaviors, the BRFSS has substantial research potential. The usefulness of the BRFSS survey is perhaps best seen in the increasing utilization of the data by states and by health researchers. Since the inception of the survey in 1984, over 200 articles and reports have been published using the data. Additional government reports at both the state and federal level use the BRFSS extensively. *State Health Profiles*, created annually by CDC, state annual reports, special reports such as the *Surgeon General's Report on Physical Activity* are representative of the scope and type of reports utilizing BRFSS data.

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