

# PUBLIC HEALTH SURVEILLANCE FOR DISEASE PREVENTION: LESSONS FROM THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

Ali H. Mokdad, PhD; Virginia S. Bales, MPH;  
Kurt J. Greenlund, PhD; George A. Mensah, MD

The burden of chronic diseases is increasing worldwide. Surveillance of behavioral risk factors is a crucial element for prevention and control of chronic diseases. Adequate surveillance data will provide the basis for developing and implementing appropriate preventive programs at the local and country level. A standardized surveillance system worldwide will allow data comparability, and will decrease the cost of the surveillance system. By using lessons from the Behavioral Risk Factor Surveillance System, a large, ongoing, state-based surveillance system in the United States, countries may save limited resources, and expedite the initiation of their own surveillance systems. To prevent cardiovascular diseases worldwide, it is time to develop and implement appropriate surveillance systems at a country level, in order to track risk factors. This strategy will provide the basis for developing intervention programs designed to reduce, or prevent a further increase in, the burden of chronic diseases. (*Ethn Dis.* 2003;13[suppl2]:S2-19-S2-23)

**Key Words:** Public Health, Surveillance, Behavior Risk Factors

## INTRODUCTION

The burden of chronic diseases is increasing worldwide. Chronic, or non-communicable diseases (NCDs), are the leading causes of death and disability worldwide. The World Health Report 2002 estimates that NCDs were responsible for almost 60% of global mortality (33.1 million deaths).<sup>1</sup> In 2001 cardiovascular diseases (CVDs), alone, caused almost one third of global deaths,<sup>1</sup> and CVDs are projected to be the leading cause of death in developing countries by 2010.<sup>2</sup> Further, it is estimated that diabetes cases worldwide will double in the next 25 years.<sup>3</sup> Four of the most prevalent NCDs, cardiovascular disease, cancer, chronic obstructive pulmonary disease, and diabetes, are linked by common, preventable risk factors, including tobacco use, unhealthy diet, and low levels of physical activity. Therefore, action to reduce the major NCDs should focus on preventing and controlling the risk factors, as well as the diseases, in an integrated manner. Public health data are essential for health monitoring, program design, and evaluation, and, therefore, are essential to achieving the goal of decreasing the burden of diseases. Timely public health data allows programs to: provide prevalence of disease and related risk factors; track trends over time; develop and evaluate targeted interventions, policy, and legislation; and evaluate progress toward achieving stated health objectives.

In the United States, the Behavioral Risk Factor Surveillance System was developed in order to collect and monitor state-specific data on major public health issues. Here, we describe the background and history of the system, its importance for chronic disease pro-

grams (using cardiovascular health as an example), efforts to expand the system, and collaborative efforts with other countries.

## BACKGROUND AND HISTORY

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of health surveys. The system was established in 1984 by the Centers for Disease Control and Prevention (CDC) in conjunction with state health departments.<sup>4</sup> Information on health risk behaviors, clinical preventive health practices, and healthcare access, primarily related to chronic disease and injury, is obtained from a representative sample of adults in each state. For most states, the BRFSS is the only source for this type of information. Currently, data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam. More than 200,000 adult interviews are completed each year, making the BRFSS the largest telephone health survey in the world. Not only is the BRFSS a unique source of risk behavior data for the states, but the system's data are also useful for measuring progress toward Healthy People 2010 objectives, for both the states and the nation.<sup>5</sup> Several Healthy People 2010 objectives can be assessed through BRFSS data, including screening rates for cervical, colon, and breast cancers; prevalence of diagnosed diabetes; use of influenza and pneumococcal vaccinations; prevalence of obesity; smoking rates; levels of physical activity; cholesterol screening rates; public awareness of signs/symptoms of heart attack and

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From the National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

Address correspondence and reprint requests to Ali H. Mokdad, PhD; Division of Adult and Community Health; 4770 Buford Highway, NE; Mailstop K66; Atlanta, GA 30341-3717; 770-488-2524; 770-488-8150 (fax); ahm1@cdc.gov

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stroke; and prevalence of binge drinking.

The BRFSS has a relatively long history, and has been a collaborative effort between the CDC and state and territorial health departments. In 1984, 15 states began to collect data on 6 individual-level risk factors associated with the leading causes of premature mortality among adults: cigarette smoking, alcohol use, physical inactivity, diet, hypertension, and safety belt use. From its inception, the BRFSS was designed to allow states to add questions of their own choosing to their individual surveys. The survey includes certain questions every year (fixed core), other questions in alternate years (rotating core), optional, standardized sets of questions on specific topics (optional modules), questions for newly arising topics (emerging core), and questions designed to meet each state's individual needs (state-added questions). These surveys have provided several key findings, including the rising prevalence rates of overweight, obesity, and diabetes.<sup>6-14</sup> Additionally, BRFSS data were used to measure the preventive care practices among persons with diabetes, in order to design programs to prevent, and/or delay the development of, serious health complications.<sup>15</sup>

## THE CARDIOVASCULAR HEALTH MODULES

The BRFSS has been an important source for CDC's state-based heart disease and stroke programs, in terms of

monitoring risk factors and evaluation of the programs. The CDC Cardiovascular Health Branch currently supports 29 states, and the District of Columbia, in developing state-based programs to reduce the burden of heart disease and stroke; funding for this program began in 1998. To be effective, state cardiovascular health programs must be able to monitor heart disease and stroke in their respective states, and must be able to evaluate their programs, in part, with data measuring health of the population; the BRFSS is an important data source for these activities. Additionally, state health programs can use the BRFSS to measure state level progress toward achieving national health goals, as set forth in Healthy People 2010.<sup>5</sup>

The Cardiovascular Health Branch supports BRFSS modules on hypertension awareness, cholesterol screening and awareness, a module on preventive practices, and a module on awareness of the signs/symptoms of heart attack and stroke. Other CDC programs support questions and modules on other CVD-relevant topics, including diabetes, tobacco use, diet, physical activity, and overweight/obesity. Currently, the hypertension and cholesterol modules are a part of the BRFSS survey's rotating core, and are utilized by all states every 2 years. The module on preventive practices was first offered in 1998, and used by 8 states; 19 states and the District of Columbia used this module in 2001. Seventeen states and the US Virgin Islands used the signs/symptoms of heart attack and stroke module in 2001, the first year it was offered. Other states have also included parts of these modules as state-added questions.

The CVD modules have been used to monitor several issues. For example, the BRFSS data indicate that in 1999, only 70% of adults reported having their cholesterol checked within the prior 5 years,<sup>11</sup> somewhat short of the Healthy People 2000 goal of 75%. Only 9 states and the District of Columbia met the Healthy People 2000 goal for

this category. Based on state trends from 1991-1999, it was further projected that fewer states would achieve the Healthy People 2010 goal of 80% for cholesterol screening, suggesting that increased public health efforts are warranted. The BRFSS data can be used to measure risk factors among particular ethnic groups,<sup>12</sup> and have been used to monitor both healthy and unhealthy lifestyle characteristics,<sup>13</sup> which influence risk of heart disease and stroke. State level prevalence rates of reported risk factors appear to correlate with state mortality rates.<sup>14</sup> The likelihood of having more than one cardiovascular disease risk factor increased in the 1990s, with the highest prevalence rates generally found in states with higher mortality rates.<sup>15</sup>

Although the BRFSS relies on self-reports of risk factors, its trends appear to follow national trends, based on directly measured risk factors. For example, the percentage of persons reporting that they had high blood pressure increased slightly from 22.9% in 1991, to 24.9% in 1999.<sup>16</sup> Likewise, the prevalence of high blood pressure, directly measured in the National Health and Nutrition Examination Surveys (NHANES), increased from 27.8% in 1988-1994, to 32.8% in 1990-2000.<sup>17</sup> Differences in prevalence estimates are partly due to differing methodologies and criteria for defining high blood pressure, self-reports of high blood pressure have been found to be reliable.<sup>18,19</sup> Trends using self-reported data may more accurately reflect prevalence when screening use is high, and virtually all persons reported having had their blood pressure checked. On the other hand, the percentage of persons in the BRFSS reporting high blood cholesterol also increased in the 1990s, though<sup>20</sup> only about 70% of persons in the BRFSS had ever had their blood cholesterol checked. In this case, the increase in reported high blood cholesterol in the BRFSS may be a result of greater screening use, rather than an actual increase.

The BRFSS CVD questions also provide data for state-based programs to use to assess secondary prevention activities. For example, questions can be used to assess physician advice and patient compliance, among persons with heart disease and stroke.<sup>21,22</sup> In 1999, 19 states and the District of Columbia included questions on physician advice about behaviors to reduce the risk of heart disease and stroke.<sup>22</sup> Overall, 2.4% of the participants reported a history of stroke. Sixty-one percent of those had been advised to eat fewer high fat/high cholesterol foods, and 85.4% of those receiving such advice reported a dietary change, compared with 56.0% of those who did not receive such advice. Almost 64% of those who reported a stroke had been advised to exercise more, and 76.5% of those receiving such advice reported exercising more, vs 38.5% of those who did not receive such advice. Persons with stroke who reported exercising, had fewer limited activity days, or days when physical health was not good, and had more healthy days, compared to persons who did not exercise.<sup>22</sup>

### SUCCESSSES WITHIN THE UNITED STATES AND ABROAD

Through the collection of behavioral data at the state level, the BRFSS has proven to be a powerful tool for building health promotion activities. As the demand for data has increased, so has the number of requests to add questions to the survey. Currently, almost all divisions of the National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP), and other CDC Centers, Institutes, and Offices (CIOs), have provided questions for inclusion on the BRFSS. Interest in the BRFSS has also grown outside of CDC. Other federal agencies, such as the Health Resources and Services Administration (HRSA), The Administration on Aging (AoA), and the Veterans Ad-

ministration (VA), have added questions to the survey.

With the growth in scope and importance of the system, some notable successes have been realized by BRFSS. Currently, all states use BRFSS data to establish and track state health objectives, plan health programs, or implement a broad array of disease prevention activities. Nearly two thirds of states use BRFSS data to support health-related legislative efforts. For example, in Delaware, data were used to support legislation to create a Healthy Lifestyle and Tobacco-Related Disease Prevention fund. In Illinois, 2 successful legislative initiatives were supported by BRFSS data: one to ban smoking in public buildings; and the other, to include mammography screening in all health insurance coverage. In Nevada, BRFSS data documenting the state's high rates of chronic and binge drinking were used to support legislation to place a per-gallon tax at the wholesale level on distilled alcohol. These efforts succeeded only because the data were state-specific.

As the usefulness of the BRFSS has increased, there has been a greater demand for more local level data; that is, data at the district, county, or city level. Although the BRFSS was designed to produce state-level estimates, growth in the sample size has facilitated production of smaller area estimates. The need for prevalence estimates at the local level has led to the "Selected Cities Project." Data from BRFSS were used to calculate estimates for selected cities in the United States having at least 300 respondents. This new use of BRFSS data has yielded estimates of health risk behaviors for 99 cities in 2000, and fills a critical public health need for local area surveillance data to support targeted program implementation and evaluation. These data should help cities to better plan and direct their prevention efforts.

In addition to these achievements, there have been numerous analyses of BRFSS data, and several articles and re-

ports have been published, both by CDC and by individual states. Every topic area has been examined, and a number of methodological investigations have been undertaken. These analyses have also resulted in publications. The majority of articles and reports have received wide dissemination in the literature and through other media. State-specific reports have been used by several states for program planning and policy development. To facilitate use of data by states, information and products developed by CDC, including all BRFSS questions and data, are disseminated through the BRFSS web site: [www.cdc.gov/brfss](http://www.cdc.gov/brfss).

Due to the success of the BRFSS in the United States, there have been requests for technical assistance from other countries eager to develop similar surveillance systems, notably China, Australia, Canada, and, most recently, Russia. With CDC's assistance, the World Health Organization (WHO) has developed a model surveillance system, the Mega Country Health Promotion Network Behavioral Risk Factor Surveillance Guide, which is based on the BRFSS and available for export to any country. The guide provides all the steps necessary for developing a surveillance system, including: 1) questionnaire development; 2) methodology; 3) sampling plan; 4) staff recruitment and training; 5) data collection and field operations; 6) data management; 7) data processing; and 8) data analysis and reporting. "Mega" countries are the 11 countries in the world with a population of 100 million or more (Bangladesh, Brazil, China, India, Indonesia, Japan, Mexico, Nigeria, Pakistan, Russia, and the United States). More information on the model is available at the World Health Organization web site: [www.who.int/hpr/mega/](http://www.who.int/hpr/mega/).

Many countries in the world are currently faced with an increased burden of chronic diseases.<sup>23</sup> Surveillance of behavioral risk factors associated with increased morbidity and mortality is key

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for developing and implementing preventive programs in these countries. An ongoing surveillance system will provide data to: 1) monitor health indicators among the population groups; 2) plan adequate programs and intervention; 3) develop policies; and 4) monitor progress to health goals and objectives. The use of a standardized methodology will allow data comparability across different countries to facilitate sharing of preventive strategies. Further, standardization will enable a country to use questions and methodology that has been tested and validated.

In general, the BRFSS offers a unique opportunity for many countries to develop and implement a surveillance system for health risk behaviors, as it provides a wealth of questions that have been tested and validated. The sampling methodology could be easily applied to either a household, or a telephone, survey. The BRFSS data are available for comparison, and most analyses, programs, and reports, could be used by other researchers. To prevent chronic diseases worldwide, it is time to develop and implement appropriate surveillance systems at a country level, in order to track risk factors. This strategy will pro-

vide the basis for developing intervention programs designed to reduce, or prevent an increase in, the increasing burden of chronic diseases.

## CONCLUSION

The BRFSS has proven invaluable in the assessment, prevention, and control of chronic diseases in the United States, and has provided the basis for on-going development and implementation of appropriate preventive programs at the local and national level. Through our partnership activities, especially with the WHO, we hope to promote increased standardization of surveillance systems worldwide, in order to facilitate data comparability, and decrease the cost of surveillance. The World Congress on Cardiovascular Health in Ghana, 2004, will provide another unique opportunity for us to extend this partnership, and to engage public health practitioners in Sub-Saharan Africa in promoting risk factor surveillance as a crucial element in the prevention of the cardiovascular disease epidemic.

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