Public Health and the Control of High Blood Pressure at the State Level 
Asleep at the Switch or Running Low on Fuel?

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In the United States today, we know a great deal about the burden of high blood pressure (BP) and the inadequacy of its prevention and control at the national level. The National Health and Nutrition Examination Survey (NHANES), created through authorizing legislation of the National Health Survey Act of 1956, collects directly measured and self-reported data relevant to biological risk factors for cardiovascular disease, including high BP. Beginning in the early 1960s, NHANES has periodically provided health data (by number and percentage) on the US population, designated subgroups with high BP, and tracked trends in the prevalence, awareness, treatment, and control of this condition. In 1999, the program became a continuously running survey designed to collect data on a nationally representative sample of approximately 5000 individuals for each year of the survey with release of data in 2-year cycles.

The National Burden of High Blood Pressure

Through the NHANES surveys, we now know that high BP affects >65 million adult Americans and that its prevalence has increased since the 1988 to 1994 period. We also know that the overall BP control rate has increased significantly among men and women, non-Hispanic blacks, and Mexican Americans. Although these national data are useful and encouraging, they do not tell us about the disease burden and level of BP control at the state or local level. But why might the additional knowledge of state or local burden of high BP be important? As much of a cliché as it may be, all health care is truly local. The availability of local-level or state-level data to inform policy and program development and decision making in the prevention and control of high BP is thus crucial. In addition, the social, environmental, and demographic determinants of population BP levels vary by state and likely contribute to variations in disease burden at the state and local levels.

The Behavioral Risk Factor Surveillance System (BRFSS), now conducted by health departments in all 50 states and those in the District of Columbia, Puerto Rico, Guam, and the US Virgin Islands, has played an important role in providing state-specific information on risk behaviors and health conditions, including high BP. Through the optional cardiovascular module, the BRFSS has provided state-specific prevalence of self-reported high BP and actions to control high BP. Unlike the NHANES, however, physical examinations are not a part of the BRFSS; therefore, BP cannot be measured. Thus, state- and local-level data on mean systolic or diastolic BP levels are not provided, and the proportion of persons with uncontrolled high BP among all persons diagnosed or those treated for high BP has been lacking.

The State and Local Burden of High BP

In June 2004, the New York City Health and Nutrition Examination Survey (NYC HANES) was designed as a new local surveillance initiative, modeled after the NHANES, to assess the prevalence of health conditions among adult residents of New York City. With periodic repetition, NYC HANES is designed to provide surveillance information on leading causes of morbidity and mortality, including high BP. No other such local surveillance for high BP currently exists. In 2005 to 2007, the Centers for Disease Control and Prevention (CDC) provided funding for 3 states to pilot versions of NHANES to produce state-level data to inform and guide states in the development of high BP and cholesterol control strategies (the Figure). A fourth state has subsequently received similar funding (2007 to 2009). Although these developments are encouraging, no other states or cities have similar surveillance capacities, and no state-level data on population-based levels of measured BP currently exist.

In a recent scientific statement on the essential features of a surveillance system to support the prevention and control of heart disease and stroke, the American Heart Association specifically recommended that the “states, territories, and tribal organizations should develop surveillance capacity to support program planning, implementation, and evaluation. Such capacity should include the ability to conduct standardized surveys that would include direct assessments of residents to enable collection of information about prevention, awareness, detection, treatment, and control of obesity, hypertension, dyslipidemia, and diabetes.” Because such “direct assessment of residents” is not performed as part of the

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BRFSS, BP levels are not measured. The study by Ezzati et al.\textsuperscript{11} in this issue of Circulation thus provides a refreshing first step in approximating state levels of mean systolic BP, the proportion of persons with uncontrolled high BP, and the state-level cardiovascular mortality rate attributable to higher-than-optimal levels of systolic BP for the period of 2001 to 2003.

In this study, Ezzati et al.\textsuperscript{11} determined the relationship between directly measured BP and self-reported data on hypertension status, medication use, and a set of sociodemographic and health system variables available from NHANES. Applying this relationship to an identical set of variables available from the state-based BRFSS permitted estimation of levels and trends in state-specific mean systolic BP and of the proportion of persons with uncontrolled high BP, not just the proportion of persons who have been diagnosed with high BP or are taking medications for it. Additionally, using recently developed comparative risk assessment methodology, the authors calculated age-standardized cardiovascular mortality rate attributable to higher-than-optimal levels of systolic BP for every state.

The greater prevalence of high BP in southern states than in the rest of the United States identified in the study is important but hardly surprising. However, the finding of a nearly 2-fold burden of cardiovascular mortality rate attributable to higher-than-optimal BP across states (410 per 100 000 in the District of Columbia versus 210 per 100 000 in Colorado and Utah for men; 360 to 370 per 100 000 in the District of Columbia and Mississippi versus 200 to 220 per 100 000 in Minnesota and Massachusetts for women) raises concern and should be a clarion call for action in all states, especially in states at the high end of the distribution of mortality rate burden for higher-than-optimal high BP. These findings further confirm high systolic BP as a powerful independent predictor of cardiovascular mortality,\textsuperscript{12} a fact well known at the national level\textsuperscript{13,14} and now extended to the state level through state-specific estimates of mean systolic BP and uncontrolled high BP.

Other findings such as the higher prevalence of uncontrolled high BP in women than in men in every state, a worsening trend of high BP control in women (but an improving trend in men) in every state, and the considerable state-by-state variations in levels and trends by age are noteworthy and deserve further in-depth examination. In particular, the lack of correlation between changes in systolic BP estimated in men and in women across states deserves careful analysis to exclude systematic sex-based disparities in the impact of state-level health programs. These findings should spur further action by state and local health departments for the prevention and control of high BP.

**State and Local Public Health in BP Control**

In a provocative editorial on local health departments and the prevention and control of chronic diseases, Frieden\textsuperscript{15} commented that local health departments “generally do a good job of monitoring and controlling conditions that killed people in the United States 100 years ago”; however, when it comes to controlling chronic diseases, all too many local health departments “are asleep at the switch.” In a response, Phillips\textsuperscript{16} countered that local health departments are not asleep at the switch but are simply “running low on fuel.” In truth, as Phillips pointed out, when resources exist to do so, local health agencies have mounted effective public health campaigns to address chronic diseases and their underlying risk factors such as high BP. Even in the context of budget cuts and competing public health priorities, state and local public health officials have tried to build local-level capacity to address chronic diseases and their risk factors.\textsuperscript{17} It is likely that efforts to garner support for increased investments in public health infrastructure to address chronic diseases and their risk factors may be more successful when local- and state-level burden data such as those generated in this study are available.

Recognition of the need for surveillance data like these is not new. About 30 years ago, the National Heart, Lung, and Blood Institute allocated funds for state-based programs to document the prevalence of high BP, to design and implement strategies for BP control, and to evaluate the impact of state-level planning and coordination on the control of high BP.\textsuperscript{18} South Carolina, 1 of 7 funded states, used findings from its baseline and follow-up statewide surveys to describe state needs, to develop intervention-targeted strategies, and to assess subsequent changes in hypertension-related mortality.\textsuperscript{18} For a variety of reasons, none of the statewide surveys exist today, although the high BP control programs they produced were cost-effective.\textsuperscript{19} The need for state and local health departments to develop and maintain necessary surveillance capacity to support program planning, implementation, and evaluation of chronic diseases and their risk factors remains as great as it was 30 years ago. The surveillance data produced on disease and risk factor burden often are the first step in developing public health intervention and evaluation programs.

**Good News and Next Steps**

Considering that surveillance is a core function of public health,\textsuperscript{20} implementation of the demonstration models of state-based cardiovascular health examination survey programs in Arkansas, Kansas, Oklahoma, and Washington, together with the NYC HANES, represents good news for public health in the prevention and control of cardiovascular...
diseases in the United States. If these initial surveillance programs can be successfully implemented and validated, the appropriate next step would be to expand support to other states to conduct similar periodic surveys. However, the resources needed to support surveillance in all states, as estimated by the American Heart Association, will be substantial (in excess of $100 million). Given limited resources for health in both federal and state budgets, the reality that such a system could be developed for all states is unlikely within the 1 to 2 years recommended. The study by Ezzati et al provides the next best approach to supplement existing surveillance systems until risk factor burden can be directly measured. In the interim, the authors could take advantage of the unique scenario in New York City, where both BRFSS and NYC HANES coexist, to assess how well their model-estimated data compare with actual measured data from NYC HANES.

In fact, if validated, this surveillance methodology need not stop at estimating mean systolic BP levels but could be extended to estimating mean blood glucose or hemoglobin A1c, the burden of uncontrolled diabetes mellitus, and the associated morbidity and mortality attributable to higher-than-optimal diabetes control at the state level. Similarly, state-specific levels of mean total blood cholesterol or low-density lipoprotein cholesterol and associated mortality from heart disease and stroke attributable to higher-than-optimal levels of these risk factors can be calculated. Of course, there is no guarantee that having these data will lead to increased resources for developing state- and local-level programs to address chronic disease prevention and control. At the very least, these data will provide additional state-specific information for building a stronger case for needed resources to support state and local public health agencies that are now running low on fuel. After all, what gets measured counts, and what counts often drives support for public health intervention and evaluation programs.

Disclosures

None.

References


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