State of the USA Health Indicators: Letter Report

ISBN
978-0-309-12862-9

98 pages
6 x 9
PAPERBACK (2009)

Committee on the State of the USA Health Indicators, Institute of Medicine

STATE OF THE USA HEALTH INDICATORS

LETTER REPORT

Committee on the State of the USA Health Indicators

Board on Population Health and Public Health Practice

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

THE NATIONAL ACADEMIES PRESS 500 Fifth Street, N.W. Washington, DC 20001

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This study was supported by contracts between the National Academy of Sciences and the State of the USA, Inc. (4108); F.B. Heron Foundation (Unnumbered Award); and William and Flora Hewlett Foundation (2007-9452). Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the organizations or agencies that provided support for this project.

International Standard Book Number-13: 978-0-309-12862-9
International Standard Book Number-10: 0-309-12862-5

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Suggested citation: IOM (Institute of Medicine). 2009. *State of the USA Health Indicators: Letter Report.* Washington, DC: The National Academies Press.

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Willing is not enough; we must do."
—Goethe

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

Joyce Dubow, AARP Office of Policy and Strategy
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Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by **Kristine M. Gebbie**, School of Nursing, Hunter College, The City University of New York, and **Nancy E. Adler**, Departments of Psychiatry and Pediatrics and Center for Health and Community, University of California–San Francisco. Appointed by the National Research Council and Institute of Medicine, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Acknowledgments

Over the course of this study, many individuals were willing to share their expertise, time, and thoughts with the committee. Their contributions invigorated committee deliberations and enhanced the quality of this report.

The study sponsor, the State of the USA, Inc. (SUSA) willingly provided information and responded to questions. The committee is particularly grateful to Joel Gurin and Jerilyn Asher of SUSA and Nicole Lurie of the RAND Corporation for their input.

Invaluable background information on existing indicator sets was provided by Cheryl Wold in her report, *Health Indicators: A Review of Reports Currently in Use*. The committee greatly appreciates the input of speakers whose presentations informed committee thinking including Carter Blakey, Robert Groves, Joel Gurin, Christopher Hoenig, Richard J. Klein, Nicole Lurie, and Cheryl Wold.

The committee was extremely fortunate in its staffing for this study. We wish to thank Lyla M. Hernandez, who did a remarkable job of directing the study. Thanks also go to Erin Hammers for her excellent research support and to Erin Rusch for her flawless administrative support.

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December 3, 2008

Christopher Hoenig
President and Chief Executive Officer
State of the USA, Inc.
1146 19th Street, NW
Suite 300
Washington, DC 20036

Dear Mr. Hoenig:

The Institute of Medicine established the Committee on the State of the USA Health Indicators to provide guidance to the State of the USA, Inc. (SUSA) on 20 potential indicators that could be used to track progress in the areas of health and health care. The body of this letter report provides the committee's findings and recommendations regarding that task.

SUSA is a newly formed, nonprofit corporation established in 2007 to provide Americans with high-quality information about changing societal, economic, and environmental conditions via a website now under development. Financial support for SUSA is currently provided by the William and Flora Hewlett Foundation, the Rockefeller Foundation, the John D. and Catherine T. MacArthur Foundation, the Carnegie Corporation of New York, the Peter G. Peterson Foundation, and the F.B. Heron Foundation.

The SUSA website is intended to provide the most reliable and objective facts about the state of the USA and to serve as a tool for Americans to track the progress made on a broad range of issues, such as education, health, and the environment. Additionally, the website will allow users to make comparisons at the local and state level as well as nation-to-nation comparisons. The ultimate goal of the website is to help Americans become more informed and, thus, active participants in focusing public debate on important issues.

Data collected in public opinion polls over the past 20 years show that the American public has identified health as a key issue. In fact, while economic issues are of primary importance, "health care issues compete for the second priority" in terms of most important problems (Westat and AmericaSpeaks, 2008). Furthermore, there is widespread discussion about health care quality (IOM, 2000c, 2001), about disparities in health and access to health care (IOM, 2003b), and about the factors that contribute to the health of individuals and populations (IOM, 2000b, 2003a). Health and health care became major points of debate in the 2008 Presidential campaign with both parties advancing their solutions to the health care problems facing the United States.

SUSA is now poised to begin populating its website with data and, with advice from The National Academies, is assembling a set of key indicators that measure specific conditions or trends. An early domain in which data will be made available is the health/health care domain. It is important to note that the SUSA website is not intended for researchers interested in pursuing in-depth analysis of various issues and relationships among variables. The intent of SUSA is to make it possible for members of the public and policymakers, in a relatively short period of time spent on the website, to discover interesting facts that are valid and important.

COMMITTEE CHARGE

The Committee on the State of the USA Health Indicators was asked to provide guidance on topic areas and indicators that should be included in the health/health care domain of the SUSA website. In conducting its task, the committee was asked to give consideration to the following:

1. Availability of high-quality data at the national level to accurately reflect the indicator construct, including the availability of data that can be broken down by important population subgroups (e.g., age, gender, socioeconomic status [SES], race/ethnicity), and geographic region (states, cities, communities);
2. Reliability and quality of data and data sources;
3. Issues that are most salient for intended audiences and users of SUSA;
4. Indicators that are sensitive to changes in other societal domains (socioeconomic or environmental conditions or public policies); and
5. Indicators that permit cross-country comparisons.

SUSA also asked that, to the degree possible, the indicators selected should be those that best reflect: (1) the overall health of the nation and the factors that are important in determining the current and future health of the nation and (2) the effectiveness and efficiency of the U.S. health care and public health systems. During the presentation by SUSA at the first committee meeting, SUSA President Christopher Hoenig stated that no more than 20 indicators should be developed for the health/health care domain. Additionally, because SUSA intends that official federal statistics will be the initial source of data (http://stateoftheusa.org/faqs/index.asp#5), the committee was charged with selecting only those indicators that could be measured with federally collected data. This letter report includes the committee's recommendations to SUSA about the topic areas and 20 indicators that should be included in the health/health care domain of the SUSA website.

COMMITTEE PROCESS

Developing a set of 20 indicators that can be used to track the progress of health and health care in the United States was a challenging task. During this 6-month study, the committee met three times. The first meeting was held in conjunction with an information gathering session with SUSA staff and consultants, and experts from organizations engaged in developing health indicators (see Appendix A for agenda). In addition, the committee reviewed existing health indicator sets and the data used to measure them. Because the study time frame was short, and to facilitate the committee's work, SUSA provided a review of health indicator reports for the committee to use as background information (Wold, 2008). A list of the reports addressed in that review may be found in Appendix B.

The committee also examined current national surveys that collect health data. These include the National Health Interview Survey, the National Health and Nutrition Examination Survey, the National Vital Statistics System, the Behavioral Risk Factor Surveillance System, the Youth Behavioral Risk Factor Surveillance System, the National Immunization Survey, the Medical Expenditure Panel Survey, the Current Population Survey, the American Community Survey, the Health Care Utilization Program, and the National Survey on Drug Use and Health.

Information on the public's perception of issues of importance in health and health care were also analyzed by the committee. These included reports of public opinion polls, focus groups, and the proceedings of a SUSA-convened working session for the policy analysis community. A recently released report by The Commonwealth Fund (2008) was also reviewed, along with other published literature related to determinants of health and performance of the health care and public health systems.

TRACKING PROGESS IN HEALTH AND HEALTH CARE

Measuring and tracking the health of populations has a long history. The London "Bills of Mortality" were published annually beginning in 1629. They contained information that allowed authorities and residents to track the number of deaths associated with the plague and other causes (Last, 2001). Mortality rates were also used in early efforts to compare the health status of populations; those with lower mortality rates were considered to be healthier than those with higher rates. Mortality rates are still used to compare the health of populations.

In the early 1800s in the United States, Lemuel Shattuck spearheaded the effort to adopt and collect public health measures at local and state levels, advocating the use of statistical surveys to collect vital information. Then, as basic survival became less uncertain and more people lived longer, new health issues such as chronic disease emerged and measures of health expanded to include assessments of morbidity. The U.S. government began, in the mid-1950s, to collect indirect measures of morbidity (e.g., symptom rates and use of health care services) through major surveys. These surveys produced population-based data that included information about specific illnesses, injuries, and levels of activity in the population (IOM, 1999). Additionally, surveys included measures of health system performance in terms of cost, efficiency, and quality. Today, measures include not only mortality and morbidity statistics but also data on health status and wellness, health systems, health expenditures and financing, and other information (IOM, 2003a).

As measures for assessing health have changed over time, so too have the frameworks for thinking about the determinants of health. In the early 1970s, Lalonde (1974) proposed a framework for thinking about health and its determinants that includes environment, lifestyle, human biology, and health care organization. The report, *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention,* identified three categories of determinants of disease and disability in the United States—preventive health services, health protection, and health promotion (DHEW, 1979). Additionally, the report included areas where improvement could be achieved given concerted effort.

Evans and Stoddart (1990) proposed a complex framework of health determinants that takes into account distinctions among disease, health, functioning, and well-being. Furthermore, that framework includes "both behavioral and biological responses to social and physical environments." Kaplan and colleagues (2000) emphasized that there are multiple levels of determinants and that bridges should be built connecting these levels in order to understand their effects on health. They proposed that the major factors affecting health include pathophysiological pathways, genetic/constitutional factors, individual risk factors, social relationships, living conditions, neighborhoods and communities, institutions, and social and economic policies. Kindig and colleagues (2008) proposed a population health framework for setting national and state health goals that included health outcomes, health determinants (health care, health behaviors, socioeconomic factors, and physical environment), and health policies and interventions. Other models that involve a multilevel understanding of health and its determinants include the works of Dahlgren and

Whitehead (1991) and Grzywacz and Fuqua (2000). Several IOM reports (IOM, 2003a,c, 2006) have emphasized the need to understand that multiple determinants of health are linked and related in many ways.

FRAMEWORK FOR INDICATOR DEVELOPMENT

No single measure can capture the health of the nation. Indicators are needed that reflect a broad range of factors such as health, risk for illness, and health system performance. As described earlier, SUSA intends that official federal statistics will be the initial sources of indicator data. Over time, as new information becomes available and the source of indicator data expands, important indicators may change. Therefore, the set of indicators presented in this report should not be viewed as perfect or permanent, rather the committee identified potential indicators that met the data constraints and then applied the framework described below to determine the final selection of indicators.

The committee considered the previously discussed frameworks of determinants of health and developed a simplified framework (see Figure 1) to guide the selection of the 20 indicators for the SUSA website. This framework for indicator development should not be interpreted as a model of the determinants of health outcomes because a complete model would need to include other determinants such as biologic or genetic predispositions that influence the ways that social, environmental, behavioral, and health services shape health outcomes.

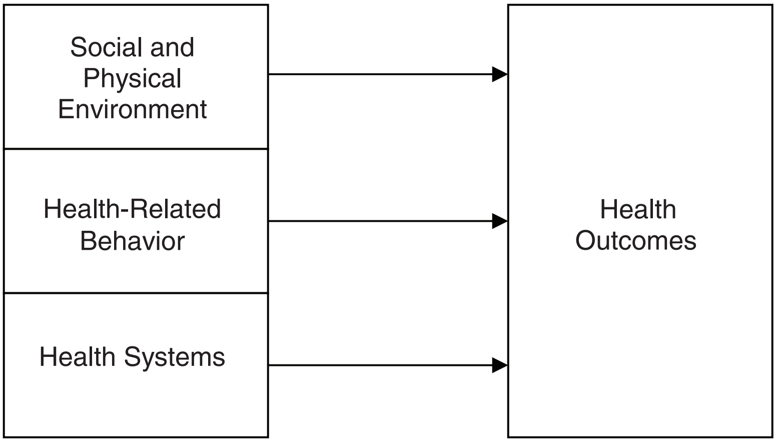

FIGURE 1 Framework for health and health care indicator development.

The indicator framework chosen shows health outcomes influenced by three types of determinants: the social and physical environment, health-related behaviors, and health systems. Health outcomes were chosen because these reflect both the well-being of the population as well as the burden of illness. Social and physical environmental determinants were selected because they play a particularly important role in health since they impact health outcomes both directly and indirectly by influencing the other determinants. Health-related behaviors were chosen because behavioral patterns account for 40 percent of the deaths in the United States (McGinnis and Foege, 1993). Finally, health systems determinants were selected because access to available services is crucial to the treatment and prevention of some illnesses.

In Figure 1 the committee recognizes, but does not show for reasons of simplicity, that sometimes health outcomes also have impact on determinants and that interactions among determinants are many and complex. The entire framework is embedded in the understanding that a broad concept of health requires equity across subpopulations in both outcomes and determinants.

Once the framework was developed (see Figure 1), each committee member was asked to identify the top 20 indicators he or she would choose for health/health care that fit within that framework. The number was limited to 20 because of the limit set by SUSA. The resulting list included almost 200 separate indicators. The next step was to place each of the indicators in one of the boxes of the framework—outcomes, health-related behaviors, health systems, or social and physical environment. Then, the committee proceeded to discuss the various indicators, what they conveyed about health or health care, and how they might be measured.

The committee examined potential indicators to make sure that there was a balance of indicators of health/health care across the life course, resulting in elimination of some. For example, life expectancy at age five was eliminated but life expectancy at birth and life expectancy at age 65 were retained. Others were eliminated because they were indicators of very similar things. For example, insurance coverage, unmet needs, and having a regular source of care were all highly related. The committee determined that, given the restriction on the number of indicators, it was necessary to eliminate one of these and decided to exclude having a regular source of care from the indicator list.

Some indicators were eliminated from consideration because adequate data are not available. For example, many quality of care indicators have been identified for particular subsets of the health care system (e.g., members of managed care plans or individual hospitals) but national data that cross health systems are not available. Indicators of state and local public health expenditures were eliminated for a variety of reasons including lack of comparability across jurisdictions, failure to capture a substantial portion of public health services and programs, or the fact that the data used reflects budgets rather than expenditures.

Other potential indicators were eliminated from consideration because the committee believes that they will be captured in other domains of the SUSA website, for example, employment and income as indicators in the economy domain; air and water quality and pollution as indicators in the environmental domain; and educational attainment in the education domain.

Indicators were selected for each of the components of the framework illustrated in Figure 1. Overall, each indicator was chosen because of its importance to health or health care; because reliable, high-quality data are available to measure change in the indicator over time; and because the data can be viewed by population subgroups or geographic region. While the committee believes that the chosen indicators reflect the overall health of the nation and the effectiveness and efficiency of U.S. health systems, it is important to note that these indicators do not fully reflect all the factors that are important to health status, health care, and public health. To include all factors would require many more indicators than 20.

Indicators are only as good as the data on which they are based. All of the indicators recommended in this report are based on data provided by the federal statistical system. The functioning of that system is often taken for granted and assumptions are made that budgets are sufficient to provide the high-quality data needed. Continuing and sufficient support for the federal statistical system is crucial to populating the SUSA website with high-quality data.

For the various indicators, the committee has identified variables such as race/ethnicity, income, and education as "drill-down" variables. That is, a user should be able to take a single health/health care indicator (e.g., infant mortality rate) and select additional displays of the data that stratify that indicator by other factors. These factors may include demographics (e.g., age, gender, race/ethnicity), socioeconomics (e.g., income, education, employment status, insurance status), and geographic region (e.g., state, county, or urban/rural).

The variables available for drill-down analysis will vary by indicator because they must be available from the original source data set used for each indicator. Another form of drill-down analysis may involve taking a single indicator (e.g., infant mortality) and allowing a more fine-grained breakdown of that indicator into one or more component indicators (e.g., neonatal mortality, postneonatal mortality, etc.). Again, the ability to do this sort of analysis will vary by indicator, depending on the level of detail available in the underlying source data.

It is important to note that as one drills down into smaller units, such as counties or for small populations, the number of events, such as infant deaths, may become so small that they are statistically unreliable. The committee believes that SUSA should develop and apply a set of standards so that unreliable estimates are not included. (See Appendix C for further discussion of statistical reliability of drill-downs and methods for improving small-area estimates.) Moreover, the committee encourages SUSA to consider several statistical techniques to reduce the instability of estimates as described in Appendix C.

The set of indicators identified by the committee is described below. For each indicator, information is provided about its importance as a measure of health/health care, the data available to measure the indicator, and the kinds of drill down analyses that can be conducted.

INDICATORS

Health Outcomes

The committee embraces a broad definition of health for the SUSA website, such as that proposed by the World Health Organization: "the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948) and the "extent to which an individual or group is able to realize aspirations and satisfy needs, and to change or cope with the environment. Health is a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources as well as physical capabilities" (WHO, 1984).

Health outcome measures are used to quantify and track the health of nations, states, communities, and individuals. In light of the small number of indicators sought by SUSA, the committee recommends eight indicators in three general outcome categories: mortality, health related quality of life (or morbidity), and major health conditions. Particular attention was given to including major causes of morbidity and mortality in different age groups, as well as important health outcomes that were not captured in the determinant categories (e.g., injury mortality). The health outcome indicators chosen are:

Mortality

- Life expectancy at birth: Number of years that a newborn is expected to live if current mortality rates continue to apply
- Infant mortality: Deaths of infants aged under 1 year per 1,000 live births

- Life expectancy at age 65: Number of years of life remaining to a person at age 65 if current mortality rates continue to apply
- Injury-related mortality: Age-adjusted mortality rates due to intentional and unintentional injuries

Health-Related Quality of Life (Morbidity)

- Self-reported health status: Percentage of adults[1] reporting fair or poor health
- Unhealthy days, physical and mental: Mean number of physically or mentally unhealthy days in the past 30 days

Condition-Specific Outcomes

- Chronic disease prevalence: Percentage of adults reporting one or more of six chronic diseases (diabetes, cardiovascular disease, chronic obstructive pulmonary disease [chronic bronchitis and emphysema], asthma, cancer, and arthritis)
- Serious psychological distress: Percentage of adults with serious psychological distress, as indicated by a score of ≥ 13 on the K6 scale

Life Expectancy at Birth

Indicator: Number of years that a newborn is expected to live if current mortality rates continue to apply. Life expectancy at birth is a standard for comparing populations both within countries and internationally. It reflects the overall mortality pattern of a population across all age groups (WHO, 2008d) and is often used as an overall measure of the state of a population's general health (Human Resources and Social Development Canada, 2008). In 2005 in the United States, overall life expectancy at birth was 77.8 years. Table 1 provides data on life expectancy at birth for selected years broken down by race and sex.

Life expectancy at birth is commonly used to identify disparities among populations. For example, Harper and colleagues (2007) used U.S. vital statistics data to assess the gap in life expectancy between blacks and whites. Meara and colleagues (2008) used life expectancy at birth to examine educational disparities in life expectancy among non-Hispanic blacks and whites.

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[1] Adults are defined as 18 years and older for all surveys except for National Health Interview Survey which considers adults to be those 17 years and older.

TABLE 1 Life Expectancy at Birth by Race and Sex for Selected Years

	All races		White		Black or African American	
Year	Male	Female	Male	Female	Male	Female
1995	72.5	78.9	73.4	79.6	65.2	73.9
2000	74.3	79.7	74.9	80.1	68.3	75.2
2005	75.2	80.4	75.7	80.8	69.5	76.5

SOURCE: Adapted from NCHS, 2007.

Life expectancy at birth is also used in international comparisons. Table 2 presents such comparisons for selected countries.

The committee believes that the *number of years that a newborn is expected to live if current mortality rates continue to apply* is an important indicator both of the health of the nation overall and as a means of identifying disparities among populations within the United States. Data for this indicator can be found in the National Center for Health Statistics (NCHS) Vital Statistics reports (http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf). Data can be analyzed by age, education level, ethnicity, marital status, national origin, place of residence, race, and sex. International data can be obtained through the World Health Organization (WHO) Statistical Information System.

Infant Mortality Rate

Indicator: Deaths of infants aged under 1 year per 1,000 live births. The infant mortality rate is a leading indicator that is used to compare populations both within and across countries. Between 2002 to 2004, the infant mortality rate in the United States for all races was 6.9 but it is important to note that infant mortality varies by geographic region and race. For example, infant mortality for whites in New England was 4.3 but for blacks it was 11.0; in the West South Central Region, white infant mortality was 6.5 but black infant mortality was 13 (NCHS, 2007).

Infant mortality is used as an indicator of the level of child health and overall development and is often used to identify disparities among populations within a specific country. Although infant mortality is sometimes criticized as focusing attention on a small part of the population, Reidpath and Allotey (2003) found that the infant mortality rate reflects the structural factors that affect population health. The committee believes that *deaths of infants aged under 1 year per 1,000 live births* is an important indicator of the health of the population.

TABLE 2 Life Expectancy at Birth for Selected Countries and Selected Years

	Male				Female			
Country	1995	2000	2003	Rank	1995	2000	2003	Rank
Australia	75.0	76.6	77.8	5	80.8	82.0	82.8	6
Bulgaria	67.4	68.5	68.9	34	74.9	75.1	75.9	35
Canada	75.1	76.7	77.4	7	81.1	81.9	82.4	9
Cuba	75.4	74.7	75.4	24	77.7	79.0	79.8	28
England and Wales	74.3	75.6	76.5	13	79.5	80.3	80.9	20
Greece	75.0	75.6	76.5	13	80.3	80.6	81.3	17
Japan	76.4	77.7	78.4	2	82.9	84.6	85.3	1
Puerto Rico	69.6	71.1	71.8	31	78.9	80.1	80.6	23
Romania	65.5	67.8	67.7	36	73.5	74.8	75.1	36
Spain	74.3	75.7	76.9	11	81.5	82.5	83.6	3
Sweden	76.2	77.4	77.9	4	81.4	82.0	82.5	7
United States	72.5	74.1	74.8	26	78.9	79.5	80.1	26

SOURCE: NCHS, 2007.

Data for this indicator can be found in the NCHS Vital Statistics reports (http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf). Data can be analyzed by age of mother, mother's education level, mother's marital status, mother's national origin, place of residence, race, ethnicity, and sex.

NCHS publishes international comparisons of infant mortality (NCHS, 2007). These comparisons show that in 2005, the United States ranked 29th in terms of infant mortality, behind such countries as Canada (24), Cuba (27), the Czech Republic (8), Greece (11), and Japan (3). Additional data for international comparisons can be obtained through the WHO Statistical Information System.

Life Expectancy at Age 65

Indicator: Number of years of life remaining to a person at age 65 if current mortality rates continue to apply. Life expectancy at age 65 is a measure that can be used as a general indicator of the overall health of those over 65, as well as the quality of, and access to, health care services among the elderly. It is also an indicator that can be used to examine inequalities across populations and can be used in international comparisons. In 2005 in the United States, life expectancy at age 65 was 17.2 years for white males, 20.0 years for white females, 15.2 years for black males, and 18.7 years for black females. Whereas life expectancy at birth is largely influenced by causes of death that affect persons at younger ages, life expectancy at age 65 is an important general indicator of the prevalence, prevention, and management of chronic disease because older persons experience a much higher incidence of these conditions than those in younger age groups.

The committee believes that the *number of years of life remaining to a person at age 65 if current mortality rates continue to apply* is an important indicator of the health of a growing segment of the U.S. population. Data for this indicator can be found in the NCHS Vital Statistics reports (http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf). Life expectancy data can be analyzed by age, education level, ethnicity, education, marital status, national origin, place of residence, race, and sex. Data for international comparison are available through the WHO Statistical Information System.

Injury-Related Mortality

Indicator: Age-adjusted mortality rates due to intentional and unintentional injuries. Injuries from intentional or unintentional causes in 2004 were responsible for about 7 percent of all deaths (167,000 deaths) in the

United States, 1.9 million hospitalizations, and 32 million initial visits (nearly one-third) to emergency departments (Bergen et al., 2008).

Kung and colleagues (2008) provide data for injury-related deaths for 2005. In that year injury-related deaths totaled 173,753. Of those deaths 43,667 (25.1 percent) were due to motor vehicle traffic, 32,691 were due to poisoning (18.8 percent), 30,694 were deaths from firearms (17.7 percent), and 20,426 (11.8 percent) were from falls—the leading cause of injury death for the elderly. Of the deaths due to poisoning, most were unintentional (72.2 percent) or suicides (17.6 percent). Data show that death rates for unintentional poisonings have increased each year from 1999 to 2005. Suicide accounted for 55.4 percent of firearm deaths and homicide for 40.2 percent.

According to Bergen and colleagues (2008), injury death and disability cause a large economic burden. Costs for lifetime medical treatment for those injured in 2000 in the United States are estimated to total $80 billion with an additional cost of $326 billion in lost productivity.

Nine percent of global mortality (more than 5 million deaths) is due to violence and injury, which are large contributors to years of potential life lost. Furthermore, of the 15 leading causes of death for people ages 15 to 29 years, eight are injury-related: road traffic injuries, suicides, homicides, drownings, burns, war injuries, poisonings, and falls (WHO, 2008a). Detailed national injury death data are available for 18 countries. The United States has the fifth highest rate of injury deaths for teens and young adults ages 15–24 (Bergen et al., 2008).

Injuries, both unintentional and intentional, are a major cause of death and disability in the United States and worldwide. The committee believes it is important to monitor *age-adjusted mortality rates due to intentional and unintentional injuries* as a means of tracking U.S. health. Data for this indicator can be found in the NCHS Vital Statistics reports (http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf). Data can be analyzed by age, education, ethnicity, marital status, national origin, place of residence, race, and sex. The WHO Statistical Information System contains data that could be used for international comparisons.

Self-Reported Health Status

Indicator: Percentage of adults reporting fair or poor health. Self-reported health status is an important indicator of the health and productivity of a population and a good predictor of morbidity and mortality as well as health care–seeking activity because people usually seek care only when they feel ill (Idler and Benyamini, 1997; Pijls et al., 1993). A study by Miilunpalo et al. (1997) found that, for middle-aged populations, self-reported health assessments are valid health status indicators. They suggest that such assessments can be used in cohort studies and population health monitoring.

Idler and Kasl (1995) found that self-ratings of health are associated with changes in functional ability. They state that such ratings have implications for functional ability as well as mortality. Idler et al. (1990) studied self-evaluated health and mortality among the elderly and found that self-perceptions of health status have prospective significance in mortality studies. Lee (2000) found that self-assessed general, physical, and mental health was predictive of functional decline and mortality among older people.

In 2005 in the United States, 30 percent of those over 75 years old reported fair or poor health while for other ages those reporting fair or poor health were 23 percent of those between 65 and 74 years, slightly over 26 percent of those 55 to 64 years of age, nearly 12 percent of those 45 to 54 years of age, 5 percent for those 25 to 44 years old, and slightly over 3 percent of those aged 18 to 24 years. A study of self-rated health and mortality in coronary artery disease patients by Bosworth and colleagues (1999) found that individuals who rated their health as "fair" or "poor" had a significantly greater likelihood of all-cause mortality. Gold et al. (1996) found that "self-rated health was better able to capture concurrent decrements in health associated with certain chronic illnesses and smoking than was use of a preference-based instrument."

Research has also found that inequalities affect self-reported health outcomes. For example, Kennedy and colleagues (1998) found that "inequality in the distribution of income was associated with an adverse impact on health independent of the effect of household income." In an examination of a multiethnic cohort, McGee and colleagues (1999) found self-reported health status to be strongly associated with both SES and subsequent mortality for both genders and all racial/ethnic groups examined.

The committee believes the *percentage of adults reporting fair or poor health* is an important indicator of the health of the nation. Data can be obtained from the Behavioral Risk Factor Surveillance System (BRFSS). BRFSS is a telephone survey carried out monthly by each state. More than 350,000 adults are interviewed each year. BRFSS data are available yearly at the state level and for some counties. BRFSS data can be analyzed by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex.

Obtaining comparable data for international comparisons is likely to prove difficult. The WHO World Health Survey collects self-rated health data, asking participants to rate their health on a specific day as very good, good, moderate, bad, and very bad. In addition to differences in the questions used to ask about self-reported health status, different populations attach different meanings to categories such as good, moderate, and bad.

Unhealthy Days Physical and Mental

Indicator: Mean number of physically or mentally unhealthy days in the past 30 days. Unhealthy days (defined as the overall number of days during the previous 30 days when the respondent felt that either his or her physical or mental health was not good) has been found to be a valid measure for perceived physical and mental health (Moum, 1999; Newschaffer, 1998). As mentioned in the previous discussion of the indicator self-reported health status, self-assessments of health are predictive of morbidity, mortality, and health-care-seeking behavior.

From 1993 to 2001, the mean number of reported physically unhealthy days increased from 2.9 to 3.4 while reported mentally unhealthy days increased from 2.9 to 3.5. (Zahran et al., 2005). Data from 2003 provide additional key findings related to physical or mental unhealthy days, which can be found on the Centers for Disease Control and Prevention (CDC) website at http://www.cdc.gov/hrqol/findings.htm. These findings include:

- Nearly a third of Americans say they suffer from some mental or emotional problem every month—including 10 percent who said their mental health was not good for 14 or more days a month
- Younger American adults, aged 18–24 years, suffered the most mental health distress
- Older adults suffered the most poor physical health and activity limitation
- Native Americans and Alaskan Natives have reported the highest levels of unhealthy days among American race/ethnicity groups
- Adults with the lowest income or education reported more unhealthy days than did those with higher income or education
- Americans with chronic diseases or disabilities reported high levels of unhealthy days (CDC, 2007a)

The committee believes that *unhealthy days physical and mental* is an important indicator of U.S. health and health care. The measures (the "Healthy Days Measure") have been part of the BRFSS full sample since 1993. In 2000, they were added to the examination component of the National Health and Nutrition Examination Survey (NHANES) (http://www.cdc.gov/nchs/nhanes.htm). NHANES is a regular survey of a representative sample of approximately 5,000 people nationwide. It is unique in that it combines an interview survey with physical examinations. Since

1999, NHANES data have been released every 2 years. To obtain the estimate of unhealthy days physical and mental, two questions are combined and a summary index is calculated. Both national and state data can be obtained from the BRFSS. Drill-down analysis of data can be conducted by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex.

While the World Health Survey asks some questions about health during the past 30 days, these questions are not comparable to unhealthy days.

Chronic Disease Prevalence

Indicator: Percentage of adults reporting one or more of six chronic diseases (diabetes, cardiovascular disease, chronic obstructive pulmonary disease [chronic bronchitis and emphysema], asthma, cancer, and arthritis). Chronic diseases account for 70 percent of all deaths in the United States each year and are a leading cause of disability. About 25 million people, nearly 1 in 10 Americans, suffer major limitation in daily living due to chronic disease (CDC, 2008f). The information displayed in Box 1 highlights the impact of chronic disease on the U.S. population.

The committee wrestled with identification of a chronic disease indicator that would reflect the burden of chronic disease in the American population, searching for an existing, widely-used method of calculating a chronic disease prevalence index but was unable to find one. Therefore, the committee chose to select specific common chronic diseases using the following criteria:

- The disease is associated with substantial morbidity or mortality;
- Quality data are readily available;
- International comparisons are possible; and
- The disease is cited in national and international documents.

Diabetes, cardiovascular disease, chronic obstructive pulmonary disease (chronic bronchitis and emphysema), asthma, and cancer account for 5 of the 6 leading causes of death in the United States (Heron, 2007). The fifth-leading cause of death, accidents, is addressed by the injury-related deaths discussed earlier in this report. Arthritis, while not contributing directly to the top causes of mortality, is the most common cause of disability in the United States (CDC, 2008j). About 1 in 5 American adults suffer from arthritis, resulting in limited mobility, work limitations, and hospitalizations. Although arthritis does not contribute directly to the top causes of mortality, it is the most common cause of disability in the United States (CDC, 2008j).

BOX 1
Costs of Chronic Disease

- In 2005, 133 million people, almost half of all Americans, lived with at least one chronic condition.
- Chronic diseases account for 70 percent of all deaths in the United States.
- The medical care costs of people with chronic diseases account for more than 75 percent of the nation's $2 trillion medical care costs.
- Chronic diseases account for one-third of the years of potential life lost before age 65.
- The direct and indirect cost of diabetes is $174 billion a year.
- Each year, arthritis results in estimated medical care costs of nearly $81 billion, and estimated total costs (medical care and lost productivity) of $128 billion.
- In 2008, the cost of heart disease and stroke in the United States is projected to be $448 billion.
- Cancer costs the nation an estimated $89 billion annually in direct medical costs.

SOURCE: Adapted from CDC, 2008g.

The committee had the option of developing a compound indicator that included conditions accounting for 5 of the 6 leading causes of death in the United States (cancer, cardiovascular disease, chronic bronchitis and emphysema, diabetes, asthma) plus a condition from which 1 in 5 Americans suffer limitations (arthritis). While national as well as state and local data are available for four of these conditions in the NHIS and the BRFSS, state and local data are not available from BRFSS for cancer and chronic bronchitis and emphysema.

The other option available to the committee was to develop an indicator that allowed for data breakdowns at the state and local levels, as well as the national level. Such an indicator would include cardiovascular disease, diabetes, asthma, and arthritis but would not include cancer and chronic obstructive pulmonary disease (chronic bronchitis and emphysema). This second option, however, provides a less comprehensive picture of the burden of chronic disease, especially for older Americans who are more likely to suffer from cancer and pulmonary problems.

After much thought and discussion, the committee decided it was best to provide a more accurate overview of the chronic disease burden in the United States and to include all six of the conditions, realizing that for only four of them would state and local data be available. While not a perfect option, this choice reflects the difficulty of selecting key indicators for which federal statistics are available and reinforces the idea that, for the future, additional data could be developed and, when available, be used by SUSA on its website.

The committee believes that the *percentage of adults reporting one or more of six chronic diseases (diabetes, cardiovascular disease, chronic obstructive pulmonary disease [chronic bronchitis and emphysema], asthma, cancer, and arthritis)*[2] is an indicator that should be used to track health and health care for the U.S. population.

Self-reported data on each of the six chronic diseases (diabetes, cardiovascular disease, chronic obstructive pulmonary disease [chronic bronchitis and emphysema], asthma, cancer, and arthritis) are available from the National Health Interview Survey (NHIS) and can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex. State and local self-report data on all but cancer and chronic obstructive pulmonary disease (chronic bronchitis and emphysema) can be found in the BRFSS and can be analyzed by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex.

While international comparisons for this indicator present difficulties, chronic disease data and their risk factors are collected and displayed by the WHO Global InfoBase.

Serious Psychological Distress

Indicator: Percentage of adults with serious psychological distress as indicated by a score of ≥ 13 on the K6 scale. Serious psychological distress is an important individual and population health issue. In 2006, there were an estimated 24.9 million adults (or 11.3 percent of the population) aged 18 or older in the United States with serious psychological distress (SAMHSA, 2008). Depressive disorders, if untreated, become chronic and are expected, by the year 2020, to be exceeded only by heart disease in contributing to the global burden of diseases (Chapman and

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[2] During its discussion of possible indicators, the committee considered inclusion of cognitive impairment as a possible candidate for chronic conditions because of its relevance to the fast growing population of elderly. However, there are two major problems with use of cognitive impairment as an indicator. The first relates to lack of diagnostic accuracy and data completeness. The second to the source of data because the nature of the condition makes it unsuited to self-report.

Perry, 2008). According to Mental Health America (2007) depression is the leading cause of disability for Americans between the ages of 15 and 44. More than $31 billion per year in productive time is lost each year due to depression.

Adults with serious psychological distress were significantly more likely to report more unhealthy days (mental and physical) and activity limitation days than were adults without serious psychological distress. Pratt and colleagues (2007) found that those with serious psychological distress were more likely to: be obese; be current smokers; be diagnosed with heart disease, diabetes, arthritis, and stroke; report needing help with activities of daily living and instrumental activities of daily living; and use more medical care services. Shih and Simon (2008) found that those with serious psychological distress have decreased health-related quality of life, were younger, had lower incomes, were unemployed or disabled, were unmarried, had fair or poor health, and had one or more chronic conditions.

U.S. employees with serious psychological distress have an increased likelihood of occupational injury (Kim, 2008). Young men aged 18 to 25 who had serious psychological distress within the past year were more likely than those without serious psychological distress to engage in heavy alcohol use, binge alcohol use, and illicit drug use (SAMHSA, 2006b). Results from a study by Hagman and colleagues (2008) indicated that adults with serious psychological distress "had greater odds of lifetime, past month, and daily use of cigarettes, cigars, and pipes than adults without" serious psychological distress.

Chapmen and Perry (2008) found that depressive disorders and increased prevalence of chronic disease are associated, and that the interrelationship has implications for the treatment of depression and the management of chronic disease. Stein and colleagues (2006) examined whether co-morbid depressive illness magnified the impact of chronic physical illness. They found that chronic physical illness with co-morbid major depressive disorder was significantly more likely to lead to health care utilization, increased functional disability, and work absence than chronic physical illness without major depressive disorder.

The committee believes the *percentage of adults with serious psychological distress as indicated by a score of ≥ 13 on the K6 scale* is an important indicator of the health of the nation. The K6 scale was designed to establish the threshold of clinical significance in order to identify cases of serious mental illness. Evidence from a validation study showed that the scale performs this function well (Kessler et al., 2003). The K6 scale was developed for use in the NHIS and is now also used in the National Survey on Drug Use and Health (NSDUH). The NSDUH is sponsored by the Department of Health and Human Services, Substance Abuse and

Mental Health Services Administration (SAMHSA) and provides yearly national- and state-level data. It includes questions about mental health as well as alcohol, tobacco, illicit drug, and non-medical prescription drug use. The committee believes that the NSDUH is the appropriate source of data for this indicator. Data can be broken down by age, county of residence, education level, employment status, ethnicity, geographic region, race, and sex.

The K6 is also included in the WHO World Mental Health Initiative, which is coordinating the implementation and analysis of surveys of mental, substance use, and behavioral disorders in all WHO Regions.

Health-Related Behaviors

McGinnis and Foege (1993) identified the critical nature of behavioral factors as causes of mortality and noted that behavioral patterns are responsible for 40 percent of the deaths in the United States. Schroeder (2007) identified several clusters of behaviors as the most important among such behavioral determinants: smoking, obesity and inactivity, alcohol use, motor vehicle accidents, gun-related injuries, substance use, and risky sexual behavior. The committee has identified under the domain of *Health-Related Behaviors* the following major areas for which indicators have been developed: smoking, physical activity, excessive drinking, nutrition, obesity, and condom use among youth. The indicators identified for the Health-Related Behaviors domain are:

- Smoking: Percentage of adults who have smoked ≥ 100 cigarettes in their lifetime and who currently smoke some days or every day
- Physical activity: Percentage of adults meeting the recommendation for moderate physical activity (at least 5 days a week for 30 minutes a day of moderate-intensity activity or at least 3 days a week for 20 minutes a day of vigorous-intensity activity)
- Excessive drinking: Percentage of adults consuming four (women) or five (men) or more drinks on one occasion and/or consuming more than an average of one (women) or two (men) drinks per day during the past 30 days
- Nutrition: Percentage of adults with a good diet (conformance to federal dietary guidance) as indicated by a score of ≥ 80 on the Healthy Eating Index
- Obesity: Percentage of adults reporting a body mass index of ≥ 30
- Condom use: Proportion of youth in grades 9–12 who are sexually active and do not use condoms, placing them at risk for sexually transmitted infections

Smoking

Indicator: Percentage of adults who have smoked ≥ 100 cigarettes in their lifetime and who currently smoke some days or every day. Currently, 19.7 percent of adults in the United States smoke (CDC, 2008d). Smoking is a leading cause of death and disability in the United States and is an important modifiable risk factor. It has been estimated that 435,000 deaths in the year 2000 were attributable to smoking (Mokdad et al., 2004). Men who smoke are more than 23 times more likely to die from lung cancer than men who do not smoke. For women, those who smoke are about 13 times more likely to die from lung cancer than women who never smoked. Of all lung cancer deaths, 90 percent of deaths in men and about 80 percent of deaths in women are attributed to smoking (HHS, 2004).

Smoking is also associated with cardiovascular disease. Risk of stroke is about double for those who smoke as compared to those who do not (HHS, 1998; Ockene and Miller, 1997). Because cigarette smoking promotes narrowing of arterial blood vessels, thereby reducing circulation, smokers are more than 10 times more likely to develop peripheral vascular disease as are individuals who do not smoke (Fielding et al., 1998). In addition, smokers are two to four times more likely to develop coronary heart disease (HHS, 1989), the leading cause of death in the United States (HHS, 2004).

Smoking is also related to an increase in chronic obstructive lung disease deaths (HHS, 1998), adverse reproductive and early childhood effects (HHS, 2004), and lower bone density in postmenopausal women (HHS, 2001).

Given the importance of the relationship between smoking and health, the committee believes that the *percentage of adults who have smoked ≥ 100 cigarettes in their lifetime and who currently smoke some days or every day* is a crucial indicator of the health of the U.S. population. The primary source for national data is the NHIS, an on-going, cross-sectional household survey of the civilian non-institutionalized population of the United States. State and local data can be obtained from the BRFSS. The CDC calculates the variable as part of the regular data release of each survey year for BRFSS.[3]

The NHIS data can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex. The BRFSS allows analysis by age, county of residence, education level, employment status, ethnicity, income, marital status,

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[3] The specific variable is current smoking, SAS name "_RFSMOK3" where 1 = not a current smoker, 2 = current smoker, and 9 = missing/refused/don't know.

race, and sex. International prevalence estimates can be found in the WHO Report on the Global Tobacco Epidemic, 2008 (http://www.who.int/tobacco/mpower/en/).

Physical Activity

Indicator: Percentage of adults meeting the recommendation for moderate physical activity (at least 5 days a week for 30 minutes a day of moderate-intensity activity or at least 3 days a week for 20 minutes a day of vigorous-intensity activity). Regular physical activity is an important contributor to health, yet fewer than 50 percent of people in the United States report engaging in moderate physical activity (CDC, 2008c). The report, *Physical Activity and Health: Report of the Surgeon General* (CDC, 1996), described numerous associations between physical activity and various health outcomes. For example, even moderate regular physical activity lowers mortality rates while higher levels are associated with lower mortality rates for both older and younger adults. Furthermore, regular physical activity is associated with decreased risk of developing conditions such as diabetes, colon cancer, and high blood pressure. Additionally, regular physical activity reduces feelings of depression and anxiety; helps control weight; helps build and maintain healthy bones, muscles, and joints; helps older adults become stronger and better able to move about; and promotes psychological well-being. The report also states that physical activity also appears to improve health-related quality of life.

Given these facts, the committee believes that physical activity of the population is important for tracking the health of the nation and proposes the following indicator to use as a measure of physical activity: *Percentage of adults meeting the recommendation for moderate physical activity (at least 5 days a week for 30 minutes a day of moderate-intensity activity or at least 3 days a week for 20 minutes a day of vigorous-intensity activity)*. The primary source for national data is the NHIS. State and local data can be found in the BRFSS. The variable is Moderate Physical Activity, SAS name “MODCAT_”, where 1 = meet the recommendation for moderate physical activity, 2 = insufficient activity to meet the recommendation for moderate physical activity, 3 = no moderate physical activity, and 9 = missing/refused/don’t know.

The NHIS data can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex. The BRFSS allows analysis by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex.

The WHO has implemented a *Global Strategy on Diet, Physical Activity* *and Health* (http://www.who.int/dietphysicalactivity/en/). It is likely that this global initiative will result in data collection on levels of physical activity.

Excessive Drinking

Indicator: Percentage of adults consuming four (women) or five (men) or more drinks on one occasion and/or consuming more than an average of one (women) or two (men) drinks per day during the past 30 days. In 2007, over 15 percent of adults reported engaging in binge drinking (males having five or more drinks on one occasion, females having four or more drinks on one occasion) while more than 5 percent reported heavy drinking (adult men having more than two drinks per day and adult women having more than one drink per day). In 2005, more than 1.6 million hospitalizations (Chen and Yi, 2007) and over 4 million emergency room visits (McCaig and Burt, 2005) were for alcohol-related conditions. Furthermore, about 79,000 people die each year in the United States as a result of excessive alcohol use (CDC, 2008b), making its use the third leading behavior-related cause of death for the nation (Mokdad et al., 2004).

Excessive alcohol use has both immediate and long-term consequences. In terms of immediate risk, alcohol use is associated with risky sexual behavior (Wechsler et al., 1994) which can result in unintended pregnancy or sexually transmitted diseases (Naimi et al., 2003); miscarriage, stillbirth, and physical and mental birth defects (AAP, 2000); unintentional injuries (Smith et al., 1999); and violence, including child maltreatment and neglect (Greenfeld, 1998; National Center on Addiction and Substance Abuse at Columbia University, 1999).

Excessive use of alcohol over the long term can lead to neurological problems (Corrao et al., 2002, 2004); cardiovascular problems (Rehm et al., 2003); psychiatric problems (Castaneda et al., 1996); social problems including family problems, lost productivity, and unemployment (Booth and Feng, 2002; Leonard and Rothbard, 1999); cirrhosis (Heron, 2007); and worsening of liver function for persons with hepatitis C virus (Schiff, 1997).

The WHO reports that there are 76.3 million persons with alcohol use disorders worldwide (WHO, 2008b), and that alcohol causes 1.8 million deaths worldwide (WHO, 2008c).

Given the effects of excessive drinking on health, the committee believes that it is important to include the following indicator on the SUSA website: *Percentage of adults consuming four (women) or five (men) or more drinks on one occasion and/or consuming more than an average of one (women) or two (men) drinks per day during the past 30 days*. The primary source for national data is the NHIS. State and local data can be found in the BRFSS and calculated by the CDC.

The NHIS data can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex. The BRFSS allows analysis by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex.

The WHO has made excessive drinking a priority and is providing technical assistance to member states to collect their own data on alcohol consumption. The Global Information System on Alcohol and Health (GISAH), the Global Survey on Alcohol and Health, and the Global Status Report on Alcohol and Health all provide information on alcohol use worldwide (http://www.who.int/substance_abuse/activities/gad/en/index.html).

Nutrition

Indicator: Percentage of adults with a good diet (conformance to federal dietary guidance) as indicated by a score of ≥ 80 on the Healthy Eating Index. Nutritional intake has a significant effect on 4 of the top 10 causes of death in the United States—coronary heart disease, some cancers, stroke, and type 2 diabetes (HHS, 2000). A diet that is consistent with the national dietary guidelines can reduce the risk of chronic disease, hypertension, osteoporosis, and anemia (HHS and USDA, 2005). Data from the 1999–2000 Health Eating Index found that 74 percent of Americans needed to improve their diet. Only 10 percent of U.S. adults had a good diet, while 16 percent had a poor diet (USDA Center for Nutrition Policy and Promotion, 2002).

It is estimated that the all-cause mortality rate in men and women could be reduced by 16 percent and 9 percent, respectively, by "the adoption of desirable dietary behaviors" (Kant et al., 2004). Nutrition is a major contributor to the rapidly growing problem of obesity, which is associated with chronic diseases, breathing problems, reproductive complications, poor quality of life, and premature death (Office of the Surgeon General, 2007).

A robust body of evidence shows the association between nutrition and health outcomes. In 2005, the Dietary Guidelines Advisory Committee, appointed by the Departments of Health and Human Services and the Department of Agriculture, did an extensive evaluation of the state of nutritional science in order to develop their recommendations on dietary intake for Americans (Dietary Guidelines Advisory Committee, 2005). They found strong evidence linking diet to cardiovascular disease, overweight and obesity, hypertension, dyslipidemias, diabetes, metabolic syndrome, cancer, and osteoporosis; that committee also noted that there are serious racial, ethnic, and socioeconomic disparities in dietary patterns and resultant health outcomes. *Healthy People 2010*, leaning on this body of evidence, set 18 objectives for the nation under the broad goal to "promote health and reduce chronic disease associated with diet and weight" (HHS, 2000).

Van Dam and colleagues (2002) conducted a study of the effects of a *prudent* diet (high intake of vegetables, fruit, fish, poultry, and whole grains) versus a *Western* diet (high consumption of red meat, processed meat, French fries, high-fat dairy products, refined grains, and sweets and desserts) on the risk of developing type 2 diabetes. They found that the *Western* diet substantially increases the risk of type 2 diabetes in men. Montonen and colleagues (2005) also conducted a study of dietary patterns and the incidence of type 2 diabetes. In this study the *prudent* diet was characterized by high consumption of fruits and vegetables while a *conservative* diet had higher consumption of butter, potatoes, and whole milk. The study found that the *prudent* diet was associated with a lower risk of type 2 diabetes while the *conservative* diet showed increased risk.

Given the relationship of diet to health, the committee believes it is important to track the *percentage of adults with a good diet (conformance to federal dietary guidance) as indicated by a score of ≥ 80 on the Healthy Eating Index* as an indicator of the health of the U.S. population.

The Healthy Eating Index (HEI) was created by the Center for Nutrition Policy and Promotion (CNPP) at the Department of Agriculture in 1995 in order to measure and track how well American diets conform to federal dietary guidance. Data are collected via a 24 hour dietary recall in the NHANES, and the HEI is used to compare the components of a respondent's diet to the dietary guidelines (see Table 3).

There are 12 categories in the HEI with which the diet is evaluated; each category has standards for minimum and maximum possible scores, and the total possible score is 100 points. For example, for the category "Total vegetables," no points would be awarded for "No vegetables" consumed, and five points would be awarded if the respondent consumed at least 1.1 cups of vegetables per 1,000 calories. The HEI can be used to look at consumption trends for individual food and nutrient categories, or can give a picture of the overall quality of the American diet. CNPP devised a rating system to assess quality: a score of 80–100 is "a good diet," 51–80 is "a diet that needs improvement," and 50 or lower is "a poor diet" (USDA Center for Nutrition Policy and Promotion, 2002). The data collected by NHANES can be analyzed by age, education level, employment status, ethnicity, income, marital status, place of birth, race, and sex. As an additional drill down, SUSA could report the percentage of persons with diets in the "needs improvement" and "poor" categories.

TABLE 3 Healthy Eating Index: 2005 Components and Standards for Scoring[a]

Component	Maximum Points	Standards for Scoring Maximum Score	Standards for Scoring Minimum Score of Zero
Total Fruit (includes 100% juice)	5	≥ 0.8 cup equiv. per 1,000 kcal	No Fruit
Whole Fruit (not juice)	5	≥ 0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables	5	≥ 1.1 cup equiv. per 1,000 kcal	No Vegetables
Dark Green and Orange Vegetables or Legumes[b]	5	≥ 0.4 cup equiv. per 1,000 kcal	No Dark Green or Orange Vegetables and Legumes
Total Grains	5	≥ 3.0 oz equiv. per 1,000 kcal	No Grains
Whole Grains	5	≥ 1.5 oz equiv. per 1,000 kcal	No Whole Grains
Milk[c]	10	≥ 1.3 cup equiv. per 1,000 kcal	No Milk
Meat and Beans	10	≥ 2.5 oz equiv. per 1,000 kcal	No Meat or Beans
Oils[d]	10	≥ 12 grams per 1,000 kcal	No Oil
Saturated Fat	10	≤ 7% of energy[e]	≥ 15% of energy
Sodium	10	≤ 0.7 gram per 1,000 kcal[e]	≥ 2.0 grams per 1,000 kcal
Calories from Solid Fats, Alcoholic beverages, and Added Sugars (SoFAAS)	20	≤ 20% of energy	≥ 50% of energy

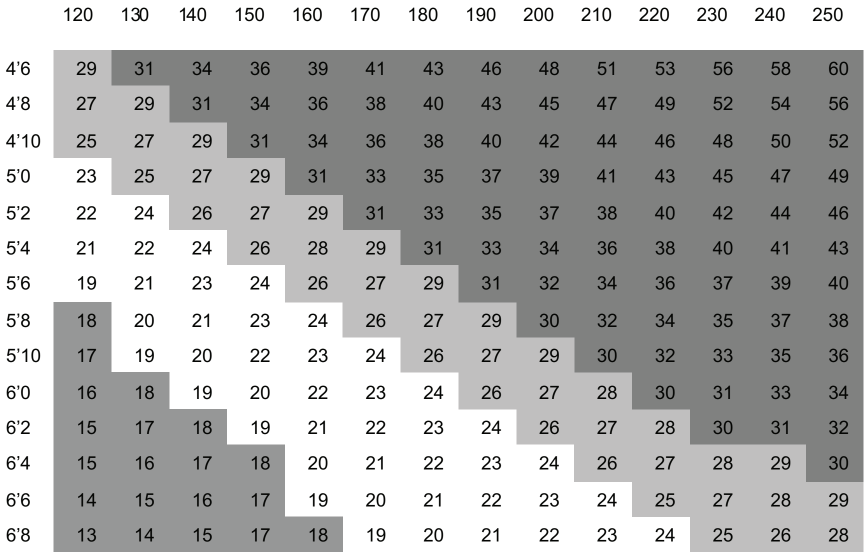
[a] Intakes between the minimum and maximum levels are scored proportionately, except for Saturated Fat and Sodium (see note *e*).
[b] Legumes counted as vegetables only after Meat and Beans standard is met.
[c] Includes all milk products, such as fluid milk, yogurt, and cheese, and soy beverages.
[d] Includes nonhydrogenated vegetable oils and oils in fish, nuts, and seeds.
[e] Saturated Fat and Sodium get a score of 8 for the intake levels that reflect the 2005 Dietary Guidelines, < 10% of calories from saturated fat and 1.1 grams of sodium/1,000 kcal, respectively.
SOURCE: Adapted from USDA Center for Nutrition Policy and Promotion, 2008.

The HEI is not well-suited for global comparisons. Because other countries do not compare their diets to the U.S. federal guidelines, they do not collect nutritional information in the same manner as the United States does. Other countries may collect data on nutrition intake, but their standards for a "good diet" are different and, therefore, not comparable.

Furthermore, many developing countries are more concerned with undernutrition and malnutrition than with nutrition standards.

Obesity

Indicator: Percentage of adults with a body mass index of ≥ 30. Obesity is one of today's most pressing public health issues. The rates of obesity (defined as having a body mass index equal to or greater than 30—see Figure 2) have risen dramatically over the past 30 years. Nationwide, obesity prevalence doubled among adults between 1980 and 2004, from 15 percent (Flegal et al., 2002) to 32.2 percent (Ogden et al., 2006). Rates of increase have leveled off in the past several years, but obesity remains steady at 34 percent (Ogden et al., 2007).



	120	130	140	150	160	170	180	190	200	210	220	230	240	250
4'6	29	31	34	36	39	41	43	46	48	51	53	56	58	60
4'8	27	29	31	34	36	38	40	43	45	47	49	52	54	56
4'10	25	27	29	31	34	36	38	40	42	44	46	48	50	52
5'0	23	25	27	29	31	33	35	37	39	41	43	45	47	49
5'2	22	24	26	27	29	31	33	35	37	38	40	42	44	46
5'4	21	22	24	26	28	29	31	33	34	36	38	40	41	43
5'6	19	21	23	24	26	27	29	31	32	34	36	37	39	40
5'8	18	20	21	23	24	26	27	29	30	32	34	35	37	38
5'10	17	19	20	22	23	24	26	27	29	30	32	33	35	36
6'0	16	18	19	20	22	23	24	26	27	28	30	31	33	34
6'2	15	17	18	19	21	22	23	24	26	27	28	30	31	32
6'4	15	16	17	18	20	21	22	23	24	26	27	28	29	30
6'6	14	15	16	17	19	20	21	22	23	24	25	27	28	29
6'8	13	14	15	17	18	19	20	21	22	23	24	25	26	28

Underweight = <18.5
Normal weight = 18.5–24.9

Overweight = 25–29.9
Obese = ≥ 30

FIGURE 2 Body mass index based on height and weight.

Obesity has been shown to be associated with several poor health outcomes, including:

- Hypertension
- Osteoarthritis
- Dyslipidemia
- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Sleep apnea and respiratory problems
- Some cancers (endometrial, breast, and colon) (CDC, 2008i)

In January 2007, the Office of the Surgeon General released information on the consequences of being overweight and obese. That information is contained in Box 2.

Estimates of the number of deaths attributable to obesity vary widely. There is debate about the methodology used to calculate this estimate, but few can dispute that obesity has a large effect on mortality. Allison and colleagues (1999) estimated that there were 280,000 to 325,000 obesity-related deaths in 1991. Mokdad (2005) revised an earlier number of 400,000 deaths associated with obesity to a lower estimate of 365,000 for the year 2000. Flegal and colleagues (2007) concluded that 112,000 obesity-related deaths occurred in 2000.

The committee believes that obesity as indicated by the *percentage of adults with a body mass index of* ≥ *30* is an important indicator of U.S. health. At the national level, data are available from NHANES. The combination of interview and physical examination in the NHANES enables more valid measurement of health conditions such as obesity because NHANES directly measures the height and weight of participants. Drill-down analysis can be performed by age, education level, employment status, ethnicity, income, marital status, place of birth, race, and sex.

At state and local levels, data should be garnered from BRFSS (http://www.cdc.gov/brfss/). BRFSS relies on self-reported data which results in underestimates of BMI because people are likely to over-report height and under-report weight. Data are available on a yearly basis broken down by age, county of residence, education level, employment status, ethnicity, income, marital status, race, and sex (http://apps.nccd.cdc.gov/BRFSS/).

The Global Database on Body Mass Index (http://www.who.int/bmi/index.jsp) provides both national and sub-national adult underweight, overweight and obesity prevalence rates by country, year of survey, and gender.

BOX 2
Overweight and Obesity: Health Consequences

The primary concern of overweight and obesity is one of health and not appearance.

PREMATURE DEATH

- An estimated 300,000 deaths per year may be attributable to obesity.
- The risk of death rises with increasing weight.
- Even moderate weight excess (10 to 20 pounds for a person of average height) increases the risk of death, particularly among adults aged 30 to 64 years.
- Individuals who are obese (BMI ≥ 30) have a 50 to 100 percent increased risk of premature death from all causes, compared to individuals with a healthy weight.

HEART DISEASE

- The incidence of heart disease (heart attack, congestive heart failure, sudden cardiac death, angina or chest pain, and abnormal heart rhythm) is increased in persons who are overweight or obese (BMI ≥ 25).
- High blood pressure is twice as common in adults who are obese than in those who are at a healthy weight.
- Obesity is associated with elevated triglycerides (blood fat) and decreased HDL cholesterol (“good cholesterol”).

DIABETES

- A weight gain of 11 to 18 pounds increases a person’s risk of developing type 2 diabetes to twice that of individuals who have not gained weight.
- Over 80 percent of people with diabetes are overweight or obese.

CANCER

- Overweight and obesity are associated with an increased risk for some types of cancer including endometrial (cancer of the lining of the uterus), colon, gall bladder, prostate, kidney, and postmenopausal breast cancer.
- Women gaining more than 20 pounds from age 18 to midlife double their risk of postmenopausal breast cancer, compared to women whose weight remains stable.

BREATHING PROBLEMS

- Sleep apnea (interrupted breathing while sleeping) is more common in obese persons.
- Obesity is associated with a higher prevalence of asthma.

ARTHRITIS

- For every 2-pound increase in weight, the risk of developing arthritis is increased by 9 to 13 percent.
- Symptoms of arthritis can improve with weight loss.

continued

BOX 2 Continued

REPRODUCTIVE COMPLICATIONS

- Complications of pregnancy:
    - Obesity during pregnancy is associated with increased risk of death in both the baby and the mother and increases the risk of maternal high blood pressure by 10 times.
    - In addition to many other complications, women who are obese during pregnancy are more likely to have gestational diabetes and problems with labor and delivery.
    - Infants born to women who are obese during pregnancy are more likely to be high birthweight and, therefore, may face a higher rate of Cesarean section delivery and low blood sugar (which can be associated with brain damage and seizures).
    - Obesity during pregnancy is associated with an increased risk of birth defects, particularly neural tube defects, such as spina bifida.
- Obesity in premenopausal women is associated with irregular menstrual cycles and infertility.

ADDITIONAL HEALTH CONSEQUENCES

- Overweight and obesity are associated with increased risks of gall bladder disease, incontinence, increased surgical risk, and depression.
- Obesity can affect the quality of life through limited mobility and decreased physical endurance as well as through social, academic, and job discrimination.

CHILDREN AND ADOLESCENTS

- Risk factors for heart disease, such as high cholesterol and high blood pressure, occur with increased frequency in overweight children and adolescents compared to those with a healthy weight.
- Type 2 diabetes, previously considered an adult disease, has increased dramatically in children and adolescents. Overweight and obesity are closely linked to type 2 diabetes.
- Overweight adolescents have a 70 percent chance of becoming overweight or obese adults. This increases to 80 percent if one or more parent is overweight or obese.
- The most immediate consequence of overweight, as perceived by children themselves, is social discrimination.

BENEFITS OF WEIGHT LOSS

- Weight loss, as modest as 5 to 15 percent of total body weight in a person who is overweight or obese, reduces the risk factors for some diseases, particularly heart disease.
- Weight loss can result in lower blood pressure, lower blood sugar, and improved cholesterol levels.
- A person with a body mass index (BMI) above the healthy weight range may benefit from weight loss, especially if he or she has other health risk factors, such as high blood pressure, high cholesterol, smoking, diabetes, a sedentary lifestyle, and a personal and/or family history of heart disease.

SOURCE: Office of the Surgeon General, 2007.

Condom Use

Indicator: Proportion of youth in grades 9–12 who are sexually active and do not use condoms, placing them at risk for sexually transmitted infections. In the United States, nearly half of all youth aged 15 to 19 years have had sex at least once. Furthermore, by age 19, 7 in 10 teens have engaged in sexual intercourse (Abma et al., 2004). Given that STD-related risk behaviors (e.g., lack of condom use) are prevalent among sexually active youth, these youth are at increased risk for acquiring STDs (Boyer et al., 1999). In fact, Schroeder (2007) identified sexual risk behavior as one of the crucial behavioral causes of premature U.S. deaths.

More than 65 million Americans are negatively affected by sexually transmitted diseases (STDs) (CDC, 2008l). According to the CDC, an estimated 12 million new cases of STDs are reported annually and 25 percent occur among youth aged 15–19 (CDC, 1998). An estimated 1 in 4 young women aged 14–19 (3.2 million teenage girls) in the United States is infected with at least one of the most common STDs (human papillomavirus [HPV], chlamydia, herpes simplex virus, or trichomoniasis) (Forhan et al., 2008).

In addition to the four STDs just mentioned, STDs include gonorrhea, syphilis, and human immunodeficiency virus (HIV). It is important to note the impact of HIV on the youth of America. Those born in 1980 or later have never known a world without HIV. Young people aged 13–29 account for more infections than among any other age group (34 percent) (Hall et al., 2008). Hence, HIV infections occur heavily among adolescents and young adults. This has led to HIV being the sixth leading cause of death among those aged 25–34 (Kung et al., 2008).

When used correctly, condoms are an effective protective device for the prevention of sexually transmitted diseases among the sexually active population. By addressing the use of condoms among sexually active youth the committee does not intend to endorse sexual activity among youth, nor does it intend to imply sexual activity in and of itself is an indicator of health. However, recognizing that such activity does take place and that unprotected sex can result in serious health problems, the committee believes an important indicator of health-related behavior is the *proportion of youth in grades 9–12 who are sexually active and do not use condoms, placing them at risk for sexually transmitted infections* is an important indicator of health-related behavior. To obtain this proportion, one multiplies the percentage of youth who are sexually active by the percentage who are not using condoms. The committee chose condom use because it relates directly to STDs and HIV. Data for this indicator can be found in the Youth Risk Behavior Surveillance System (YRBS) which monitors health-risk behaviors among youth. The YRBS is a national, school-based survey conducted every two years during the spring semester. It provides data representative of 9th through 12th grade students in public and private schools throughout the United States. Trend information is available from 1991. Data can be disaggregated by ethnicity, grade in school, race, and sex.

While WHO collects data on condom use among young people (http://www.who.int/whosis/indicators/compendium/2008/2pco/en/index.html), because the WHO age range is 15–24 years, the data are not comparable.

Health Systems

The health system is broadly defined as the set of institutions and actors whose purpose is to maintain or improve people's health. The health system includes the health *care* system, those directly involved in care delivery, as well as the *public health* system that attempts to improve or maintain health by affecting health-related behaviors and environmental factors or by other population-oriented activities such as surveillance, food service inspections, water quality testing, and mosquito abatement.

The distinction between providing health care and other health-promoting interventions does not correspond neatly to any division into health care and public health organizations. Improving the health of the U.S. population requires that the health care and public health systems work together. The IOM report, *The Future of the Public's Health in the 21st Century* (2003a), elucidated the need for a public-private partnership among the health care delivery system, governmental public health agencies, employers and business, the media, academia, and communities to "work individually or together to create the conditions necessary to assure the best possible health for the nation."

Immunizations and screening examinations, for example, might be provided at a clinic, paid for by insurance, or might be offered at a school by a public health agency. On the other hand, an individual might receive counseling on diet and exercise during a visit to a doctor's office, through health-promotion literature from a health plan, or through a presentation at a church or community meeting by a municipal public health worker.

To assess the impact of the public health system on health requires an examination of capacity and performance. However, no such systematic measures currently exist for the public health system. Even aggregate measures of public-sector expenditure can not be interpreted because of variations across states in how the provision of different types of services are organized and allocated to different agencies. Had valid and reliable systematic measures of public health system capacity and performance existed, the committee would have recommended at least one such measure for inclusion in this report. Instead, public health activities are measured indirectly through measures of health-related behaviors, health outcomes, and environmental factors described in other sections of this report. Consequently, the indicators included for the health system focus primarily on the health *care* system which includes publicly and privately financed services as well as those provided by both public health organizations and the private sector.

There are numerous measures of the performance of the health care system and several different frameworks for organizing them. The two frameworks presented below were considered in organizing the health system indicators. The first, drawn from *Crossing the Quality Chasm* (IOM, 2001) defines the following dimensions of quality: effectiveness, timeliness (including access), patient-centeredness, safety, efficiency, and equity. For purposes of this study, the committee collapsed this framework into the three major categories of quality of care (effectiveness, patient-centeredness, and safety), cost (representing one component of efficiency), and access (a relabeling of timeliness to focus on the broader system perspective).

The committee notes that measurement of efficiency per se on a system-wide national basis (rather than for specific processes of care) is controversial because it requires having a measure of the aggregate value of the output of the health care system; hence the committee focuses on costs, allowing consumers of the data to draw their own conclusions about whether one obtains value for that cost in light of health outcomes achieved. Equity is regarded as a cross-cutting perspective that is addressed in the proposed measures described in the section on disparities.

The second framework, the consumer perspectives framework, is taken from the Foundation for Accountability (FACCT).[4] This framework considers types of health care needs: staying healthy (prevention and primary care), getting better (recovery from an illness or injury, roughly corresponding to acute care), living with illness or disability (corresponding to chronic care), and coping with end of life (end-of-life care).

The combination of these cross-cutting frameworks defines many potential categories of measures, and for some of these categories there are numerous potential measures as illustrated by those included in the National Healthcare Quality Report (AHRQ, 2005). Because the number of indicators for the SUSA Health Indicators study was sharply constrained, the committee chose to focus on domains for which there are measures of fairly broad generality and not on disease-specific measures. When

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[4] FACCT was "a not-for-profit organization dedicated to consumer input into health care." (http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/Resources/Foundation+for+Accountability+(FACCT).htm). Accessed 10/20/08.

possible, the committee used either measures of general applicability or measures that were composites of several more specific measures, but only when those measures are well established and have potential to be produced on an ongoing basis.

The committee found that within the quality of care domain, the most mature and generalized measures with population coverage were in the subdomain of effectiveness. The committee was also limited by the fact that many measures of quality of care are specific to particular subsets of the health care system (e.g., members of managed care plans) and are, therefore, not optimal for providing national measures of quality.

From the patient perspective, there are numerous measures of particular processes of acute care or particular care settings, but generalized measures are less evident; measures of end-of-life care are even less available. Therefore, the committee focused on the staying healthy and chronic care domains, motivated as well by the high burden of chronic disease on both quality of life and costs of care.

The committee has, therefore, developed six indicators for the health system as described below.

Cost:

- Health care expenditures: Per capita health care spending

Access:

- Insurance coverage: Percentage of adults without health coverage via insurance or entitlement
- Unmet medical, dental, and prescription drug needs: Percentage of (non-institutionalized) people who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year

Effectiveness of Care:

- Preventive services: Percentage of adults who are up-to-date with age-appropriate screening services and flu vaccination
- Childhood immunization: Percentage of children aged 19–35 months who are up to date with recommended immunizations
- Preventable hospitalizations: Hospitalization rate for ambulatory-care-sensitive conditions

Health Care Expenditures

Indicator: Per capita health care expenditures. Per capita health spending is used to track expenditures over time within the United States and is one of the most widely used comparative indicators with other countries.

Although ideally one would want direct measures of the efficiency of national health care systems, no such measures exist. Instead, judgments concerning relative efficiency of national health systems are made by lining up levels of health care spending across countries with indicators of health outcomes, such as infant mortality and life expectancy. Since the committee has recommended a number of health outcome indicators for the SUSA website for which cross-national comparisons are available, including the per capita health care expenditures measure will allow users to make these comparisons and form judgments about the relative efficiency of the U.S. health care system relative to other developed nations. Typically these comparisons suggest that the U.S. system is among the least efficient. Per capita costs or costs as a percentage of the U.S. gross domestic product (GDP) are far higher than in other developed nations, while health outcomes are often no better or at times worse.

In 2006, U.S. per capita health care expenditures were 7,026 (CMS, 2008). Personal health care spending is about 86 percent of total health expenditures in the United States (NCHS, 2007). The percentage of the GDP devoted to health,[5] 16 percent in 2006, is projected to continue to grow, implying that health care costs are rising at a faster pace than growth in the economy as a whole. In its most recent 10-year health spending projection, the Centers for Medicare and Medicaid Services Office of the Actuary expects U.S. health care spending to nearly double between 2007 and 2017, from roughly $2.2 trillion to $4.3 trillion, increasing the share of GDP devoted to health from 16.3 percent to 19.3 percent.

U.S. per capita health spending greatly exceeded per capita health spending of the other countries in the Organisation for Economic Co-operation and Development (OECD) (Reinhardt et al., 2004). Cross-national comparisons of health expenditures are constructed by the OECD after making adjustments for purchasing power parities (PPPs). PPPs are based on price ratios of the same products in different countries and, in principle, when they are used to divide expenditures on health, the differences in price levels among countries are removed and expenditures can be compared in real terms.

Per capita health care expenditures are both an important comparative indicator and an indicator of the economic burden placed on the U.S. economy. Health care is an expense to patients and third-party payers, but a source of income to providers. According to Reinhardt and colleagues (2004), "at the local level, policymakers usually give much weight to the employment opportunities offered by a growing health sector, which leads them to resist reductions in or closing of local health care facilities.

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[5] Health expenditures include expenditures for health care as well as insurance administration and public health.

On the other hand, at the macroeconomic level, policymakers often view growing health spending with alarm."

The committee believes that *per capita health care expenditure* is an important indicator for U.S. policy makers and the public. The committee considered health spending as a percentage of GDP as a substitute measure. Aggregate health spending grows with population size and with national income, among other factors. Thus, cross national comparisons of health spending as a percentage of GDP implicitly controls for both population size and income, while national comparisons of per capita spending control for population size only. However, the committee chose per capita spending for two reasons: (1) the committee believes that per capita spending will be more readily understood by SUSA consumers, and (2) per capita spending is available at the state level from the Centers for Medicare & Medicaid Services (CMS) while spending as a percentage of GDP is only available at the national level. Should SUSA increase the number of health indicators in the future, consideration should be given to the addition of health spending as a percentage of GDP.

State data for per capita health care expenditures can be obtained from CMS, National Health Expenditure Account (NHEA) (http://www.cms.hhs.gov/NationalHealthExpendData/05_NationalHealthAccountsStateHealthAccounts.asp). Caution must be taken in reporting state per capita expenditures due to the necessity of border crossing and other adjustments. International comparisons are available from the OECD website (http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html). These data can be analyzed by age, source of funding for services, state, and type of service delivered.

The committee considered using total per capita health expenditures from the Medical Expenditure Panel Survey (MEPS) to supplement the cross-national OECD numbers. This would allow drill downs across socio-demographic groups nationally. However, the MEPS variable is not equivalent to per capita spending in the NHEA. The MEPS figures do not include long-term care, over-the-counter drugs, public health spending, and administrative costs for insurance. In addition, there is some underreporting in MEPS. Despite the differences, MEPS per capita health spending, broken down by demographic subgroups, would provide useful information if included with appropriate caveats.[6] MEPS data can be downloaded at http://www.meps.ahrq.gov/mepsweb/data_stats/download_data_files.jsp. The following website for MEPS provides data in table format: http://www.meps.ahrq.gov/mepsweb/data_stats/quick_ tables_search.jsp?component=1&subcomponent=0.

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[6] Sing and colleagues (2006) provide a comparison of the estimates from MEPS and from the NHEA.

Data in MEPS can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex.

Insurance Coverage

Indicator: Percentage of adults without health coverage via insurance or entitlement. Lack of health insurance coverage is a well-established determinant of access to care and is responsible for about 18,000 unnecessary deaths in the United States each year (IOM, 2004b). The number of uninsured grew from 32.9 million of the population in 1990 to 43.3 million in 2002 (IOM, 2004b). By 2007 that figure had risen to 45.7 million (Sherman et al., 2008). Those who are uninsured, even for brief periods of time, are increasingly likely to report having no regular source of care, unmet health care needs, and unmet need to see a provider (Sudano et al., 2002). The uninsured are also less likely than those with insurance to obtain preventive services and care for major health conditions such as traumatic injuries, heart attacks, and chronic diseases, thus leading to serious consequences (Dorn, 2008; Kaiser Commission on Medicaid and the Uninsured, 2008).

According to the Institute of Medicine Committee on the Consequences of Uninsurance:

- The number of uninsured individuals under age 65 is large, growing, and has persisted even during periods of strong economic growth.
- Uninsured children and adults do not receive the care they need; they suffer from poorer health and development, and are more likely to die early than are those with coverage.
- Even one uninsured person in a family can put the financial stability and health of the whole family at risk.
- A community's high uninsured rate can adversely affect the overall health status of the community, its health care institutions and providers, and the access of its residents to certain services (IOM, 2004b).

The committee believes that the *percentage of adults without health coverage via either insurance or entitlement* is an important indicator for health and the health care system in the United States. Federal surveys that measure the rate of uninsurance arrive at somewhat different estimates in large part because they ask about insurance coverage in different ways. The Current Population Survey (CPS) estimates tend to provide relatively high estimates of the number of uninsured compared with estimates from NHIS and MEPS.

The CPS estimates the number of uninsured as the residual after respondents are asked a set of questions about whether they had other types of insurance over the course of the previous year. Thus, it is an estimate of the number who were uninsured over the entire previous year. However, the estimates are similar to point-in-time estimates obtained from the Survey of Income and Program Participation (SIPP). Because of this CPS estimates are interpreted as point-in-time estimates.[7] Although there is good reason to believe that estimates from the other federal surveys are more accurate, we recommend use of the CPS estimates because they are the most widely cited, the CPS is the only survey that supports state-level estimates by various types of insurance coverage, and because the CPS has the longest time series of past estimates. Moreover, all federal and nonfederal surveys that ask about insurance coverage obtain very consistent patterns with respect to disparities across socio-demographic groups. The committee suggests that SUSA provide drill-down analysis capabilities that allow users to look at the percentage of people with various types of insurance coverage including Medicare, Medicaid, employer sponsored, and private non-group.

National and state estimates based on CPS data are available annually from the Census Bureau in their current population reports, P60–235 (http://www.census.gov/prod/2008pubs/p60-235.pdf).

The Census Bureau has altered the way it asks insurance questions several times over the past 20 years or so. The Employee Benefit Research Institute (EBRI) has made some statistical adjustments to account for the alterations. EBRI tabulations of CPS data are available at http://ebri.org/publications/ib/index.cfm?fa=ibDisp&content_id=3975.

County-level data beginning in 2001 are available at http://www.census.gov/hhes/www/sahie/index.html. These data are from the Census Bureau's Small Area Health Insurance Estimates (SAHIE) program, which produces model-based small area estimates of health insurance coverage rates for states and all counties. Previously, SAHIE released the first nation-wide set of county-level estimates on the number of people without health insurance coverage for all ages and those under age 18 based on data from 2000 and 2001. SAHIE recently released 2005 estimates of health insurance coverage by age, sex, race, Hispanic origin, and

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[7] See *How Many People Lack Health Insurance and for How Long?* (Congressional Budget Office, 2003) and *People with Health Insurance: A Comparison of Estimates from Two Surveys* (Census Bureau, 2004) for comparisons of health insurance coverage rates from the major federal surveys.

income categories at the state level and by age, sex, and income categories at the county level.

The American Community Survey (ACS) began asking an insurance question in 2008; resulting data will be available in 2009. The question phrasing differs from the way in which CPS ascertains the rate of uninsurance, therefore there may be some comparability issues. Eventually, however, the ACS should provide the ability to generate numbers for counties. ACS will report estimates for geographic areas with populations of 65,000 or more and will eventually report 3-year averages for geographic areas that meet a population threshold of 20,000 or more. The ACS numbers are likely to be of higher quality than the SAHIE numbers and will be produced annually. Therefore, with appropriate caveats about the comparability of the CPS and ACS estimates, the committee believes that the ACS data can be used at the local level. ACS data can be analyzed by age, citizenship, education level, employment status, English proficiency, ethnicity, income, marital status, race, and sex. In the short run however, SAHIE numbers might be included in the SUSA website.

Unmet Medical, Dental, and Prescription Drug Needs

Indicator: Percentage of (non-institutionalized) people who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year. Unmet need is an indicator commonly used to portray problems in access to health care services, including lack of health insurance and limited availability of providers (Newacheck et al., 2000). Weinick and Drilea (1998) found that 11.6 percent of families in the United States (12.8 million families) either did not receive needed health care or experienced difficulty or delay in obtaining such care. Although a variety of factors are cited as reasons for unmet/delayed care needs (e.g., insurance barriers, transportation difficulties), cost is the most common factor cited. Those who experienced difficulty were more likely to have higher disability levels and live alone (Williams et al., 1997), to come from families in which one or more members lacked health insurance or reported poorer health status, or have a Hispanic head of family (Weinick et al., 1997).

Long and colleagues (2002) found that more than 1 in 3 rural Medicaid beneficiaries reported delaying or not being able to obtain care they believed they needed. And unmet need remains a problem for U.S. children. During 1993, 1.3 million children were unable to obtain needed medical care, 4.2 million were unable to obtain needed dental care, and more than 800,000 were unable to obtain needed prescription medicine and/or glasses (Simpson et al., 1997). Children who are near poor or poor are three times more likely to have difficulty obtaining services than children who are not poor (Newacheck et al., 2000). Despite the enactment and implementation of the State Children's Health Insurance Program in the late 1990s, the percentage of low income children with unmet or delayed care needs has risen significantly in the 10 years since the program's enactment (Cunningham and Felland, 2008).

For children, failure to obtain treatment can have both near- and long-term consequences for health status and functioning. Szilagyi and Schor (1998) found that "untreated physical, psychological, and behavioral problems put children at risk for developing lifelong chronic conditions."

Unmet need is also associated with greater emergency room use (Long et al., 2002, 2005) and disadvantaged individuals delay care for conditions that are associated with longer hospital stays and poorer health outcomes (Weissman et al., 1991). Crimmel and Stagnitti (2005) found that 7.4 percent of families were not able to obtain needed prescription drugs.

The committee believes that unmet need is an important dimension of health and health care in the United States. Data for an indicator reflecting this concept can be obtained from questions in the MEPS household component. The indicator is the *percentage of (non-institutionalized) people who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year*. The questions required to construct this are contained in the access to care section of the MEPS questionnaire. (People who have unmet or delayed care needs are those coded "1" in any of the following variables: MDUNAB42, MDDLAY42, DNUNAB42, DNDLAY42, PMUNAB42, PMDLAY42.) The instrument can be found at http://www.meps.ahrq.gov/mepsweb/survey_comp/hc_survey/2005/AC95.htm.

The Agency for Healthcare Research and Quality (AHRQ) has generated national tables based on this measure. The most recent data available are for 2005 (broken down by demographic characteristics) and can be found at http://www.meps.ahrq.gov/mepsweb/data_stats/summ_tables/hc/acc/2005/acctocare_4_1_2005.htm.

State-level estimates can be generated from MEPS for some large states. BRFSS has a somewhat similar variable (MEDCOST) that reads: "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" The committee prefers the MEPS variable because it is based on a more complete ascertainment of costs and a nationally representative sample. MEPS data can be analyzed by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex.

The committee suggests that in addition to the composite unmet/delayed needs measure, SUSA should provide users with the capability to drill down to look at unmet medical, dental, and prescription drug needs individually. Although rates of unmet needs for these three types of services are likely to be highly correlated with one another over time and across demographic groups, the rates of change are likely to differ for different population groups and in different geographic areas. For example, dental coverage is an optional benefit under the Medicaid program. Even among states that offer dental benefits under the Medicaid programs, there are substantial program differences and reimbursement rates among states that affect access among those with Medicaid coverage (Heslin et al., 2001).

Prescription drug access problems are of special concern because prescription drugs are becoming a more important part of treatment for medical and psychiatric problems but affordability problems have risen rapidly in recent years. On the other hand, the introduction of the Medicare Part D program has affected access to prescription drugs among the elderly.

Preventive Services

Indicator: Percentage of adults who are up-to-date with age-appropriate screening services and flu vaccination. Clinical preventive services include health care interventions designed to prevent the occurrence of disease or to detect disease that is already present. The term clinical refers to the fact that these services are provided to individuals one at a time, usually in clinical settings, rather than to communities or populations. Immunizations are a classic example of preventive services; colonoscopy is a clinical service that is considered both screening and prevention because pre-cancerous lesions can be removed before colon cancer develops. The term “screening” refers to the use of one or more diagnostic tests to detect disease in an early stage, before it causes symptoms and before it has caused serious or irreversible health problems. Clinical preventive services also include counseling and chemoprophylaxis.

Screening services have been found to improve health and reduce health care expenditures. For example, HIV screening in pregnant women greatly decreases mother-to-child transmission rates (Chou et al., 2005) and mammography has reduced mortality rates from breast cancer in women 40–75 years of age (Humphrey et al., 2002). According to the CDC, “Preventive screenings are an important part of health promotion efforts. Many preventive screenings have been recognized as a cost-effective way to identify and treat potential health problems before they develop or worsen” (CDC, 2007b). A study by Maciosek and colleagues (2006) that studied the health impact and cost-effectiveness of colorectal cancer screening found that for people aged 50 and older, screening for colorectal cancer at recommended intervals would prevent 18,800 deaths.

They concluded that “colorectal cancer screening is a high-impact, cost-effective service used by less than half of persons aged 50 and older.”

Vaccination against influenza is another cost- and health-enhancing measure. The CDC notes, “Influenza vaccination is the most effective method for preventing influenza virus infection and its potentially severe complications” (CDC, 2008h). Rates of serious illness and death from the influenza virus infection rates are highest among children less than 2 years old, people 65 and older and those with serious medical conditions. From 1990 to 1999 the annual average number of deaths from influenza was 36,000 while from 1979 to 2001 there were 226,000 hospital admissions were associated with influenza (CDC, 2008a). The Advisory Committee on Immunization Practices (ACIP) recommends influenza vaccination for all adults, but especially for those who are at high risk for influenza complications or in close contact with persons at high risk (see Box 3) (CDC, 2008e).

BOX 3
Persons at High Risk for Complications from Influenza or In Close Contact with High-Risk Individuals

- Persons aged > 50 years;
- Women who will be pregnant during the influenza season;
- Persons who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, hematological or metabolic disorders (including diabetes mellitus);
- Persons who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus);
- Persons who have any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration;
- Residents of nursing homes and other chronic-care facilities;
- Health-care personnel;
- Household contacts and caregivers of children aged < 5 years and adults aged > 50 years, with particular emphasis on vaccinating contacts of children aged < 6 months; and
- Household contacts and caregivers of persons with medical conditions that put them at high risk for severe complications from influenza.

SOURCE: CDC, 2008e.

The U.S. Preventive Services Task Force (USPSTF) has recommended a set of clinical preventive services, determined in part by age, sex, and presence of specific known risk factors (e.g., family history of breast cancer). The recommended preventive services are those supported by a substantial body of high-quality evidence of effectiveness and/or cost-effectiveness. These recommendations have changed somewhat over time to reflect both new screening or prevention technologies or new evidence about existing technologies.

The list of services recommended by the USPSTF is quite long, and the committee found that there is no good, single data source on receipt of the entire set of services. However, it is possible to derive an indicator of receipt of several key screening tests, as well as flu shots, for adults, using MEPS data. Demographic data in the survey (age, sex) are used to define the subset of respondents who should have received a specific service (e.g., mammography); specific questions ask respondents whether they have received the service in a defined period of time. An aggregate index summarizing responses to the specific questions can be interpreted as an indicator of receipt of screening and preventive services for adults.

The committee believes that recommended preventive services improve health and prevent costly health care expenditures and therefore, the *percentage of adults who are up to date with age-appropriate screening services and flu vaccination* should be included in the list of indicators for the domain of health/health care.

The original data source is MEPS. Cathy Schoen of the Commonwealth Fund (2008) developed a preventive care indicator and B. Mahato of Columbia University provided the programming algorithm that can be used to derive the composite indicator from responses to selected questions in the series AP15–AP26. The detailed algorithm and coding can be found in Appendix D. The specific screening/preventive services in the indicator include: blood pressure screening, cholesterol screening, mammography, Pap test, fecal occult blood testing or colonoscopy/sigmoidoscopy, and influenza immunization. As guidelines for clinical preventive services change, some minor changes to the algorithm for using MEPS data to calculate the index may have to change to keep the indicator aligned with current guidelines. For example, if the recommended age bands for mammography or colonoscopy change, the ages used to select eligible respondents in MEPS for specific preventive services should change accordingly.

The structure of the MEPS survey allows for analysis by age, citizenship, education level, employment status, ethnicity, income, insurance status, place of birth, race, and sex.

TABLE 4 Early 20th-Century Morbidity from Eight Diseases Compared with Morbidity from 1998

Disease	Baseline 20th-Century Annual Morbidity	1998 Morbidity
Smallpox	48,164	0
Diphtheria	175,885	1
Pertussis	147,271	6,279
Tetanus	1,314	34
Poliomyelitis (paralytic)	16,316	0
Measles	503,282	89
Mumps	152,209	606
Rubella	47,745	345

SOURCE: Adapted from CDC, 1999.

Childhood Immunization

Indicator: Percentage of children aged 19–35 months who are up to date with recommended immunizations. At the beginning of the 20th century, outbreaks of infectious diseases were frequent in the United States. The development of vaccines has resulted in a significant drop in incidence for many of these diseases. Table 4 provides data comparing the rates of morbidity from eight infectious diseases at two points in time: in the early 20th century and in 1998 after vaccines had been developed.

Because many vaccine-preventable diseases primarily affect young children and infants, immunizations are given early in life. Seventy-seven percent of U.S. children 19 to 35 months of age have received the ACIP-recommended series[8] of childhood vaccines (CDC, 2007c). High rates of childhood immunization are important to protect not only individual children, but also outbreaks of disease among communities.

There are disparities in immunization rates, however. For example, children living below the poverty level have lower immunization rates (NCHS, 2007). Furthermore, disparities exist in immunization rates among racial and ethnic groups and by poverty level (NIS, 2007a) causing concern about potential outbreaks of disease in urban areas with large underserved populations. Childhood immunization rates also vary by geographic region (NIS, 2007b).

When vaccination coverage rates drop, measles, a vaccine-preventable

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[8] The recommended series consists of four doses of diphtheria, tetanus, and pertussis vaccine; three doses of polio vaccine; one or more doses of measles, mumps, and rubella vaccine; three doses of Haemophilus influenzae type b vaccine (Hib); three doses of hepatitis B vaccine; and one or more doses of varicella or chickenpox vaccine (http://www.cdc.gov/media/pressrel/2007/r070830.htm).

disease, is one of the first to reappear. During the first half of 2008, the CDC received reports of 131 measles cases (from 15 states and the District of Columbia). From 2000 to 2007, the average number of cases per year was 63. Of 123 U.S. residents involved, 112 were unvaccinated or had unknown vaccination status (CDC, 2008k). Measles outbreaks are also occurring in Austria, Italy, Switzerland, and the United Kingdom (UK). The UK has declared that measles is again endemic to that country because of a drop in vaccination coverage levels (Eurosurveillance Editorial Team, 2008; Filia et al., 2008; UK Health Protection Agency, 2008). Decreasing vaccination rates are of particular concern for those who are unable to be vaccinated because of immunological compromise—two measles related deaths in such children have been reported since April 2008 (Filia et al., 2008; UK Health Protection Agency, 2008). Additionally, healthy children who contract measles are also subject to complications such as "encephalitis and pneumonia, which can lead to permanent disability or death" (CDC, 2008k). Both WHO and UNICEF collect data on immunization coverage.

The committee believes the *percentage of children aged 19–35 months who are up to date with recommended immunizations* is an important indicator of the health of the United States. The data source for this indicator is the National Immunization Survey (http://www.cdc.gov/nis/) which is sponsored by the National Center for Immunizations and Respiratory Diseases (NCIRD) and conducted jointly by the NCIRD and the National Center for Health Statistics. Estimates are produced for the nation and for each of 78 Immunization Action Plan (IAP) areas, consisting of the 50 states, the District of Columbia, and 27 large urban areas.

Data since 1994 are available at the national and state levels (although methods changed in 1998 making before-and-after comparisons difficult). Data are also available for some large urban areas, but not all. Data are readily available broken down by age and by mother's and child's race/ethnicity (http://www.cdc.gov/vaccines/stats-surv/nis/data/tables_2007.htm). Raw data can also be downloaded by sex, family income, mother's educational status, and ZIP code.

Preventable Hospitalizations

Indicator: Hospitalization rate for ambulatory-care-sensitive conditions. Ambulatory-care-sensitive conditions (ACSC) are those for which hospitalization can be avoided if good outpatient care or early intervention to prevent complications is provided. Hospitalization for ACSC may indicate problems in access to ambulatory care or poor-quality outpatient management (AHRQ, 2004; Billings et al., 1996). Pappas and colleagues

(1997) found that 12 percent of all hospitalizations (3.1 million hospitalizations) were for potentially avoidable conditions.

AHRQ has developed the Prevention Quality Indicators (PQIs) to track hospital admission rates for 14 ACSCs:

- Diabetes, short-term complications
- Diabetes, long-term complications
- Uncontrolled diabetes
- Lower extremity amputations among patients with diabetes
- Perforated appendicitis
- Chronic obstructive pulmonary disease
- Congestive heart failure
- Angina without procedure
- Hypertension
- Low birth weight
- Dehydration
- Bacterial pneumonia
- Urinary infections
- Adult asthma

Although hospitalization for these conditions can often be avoided with high quality ambulatory care, any particular individual's hospitalization may also reflect other factors including inadequate monitoring, lack of the patient education needed for appropriate self-management, or patient preference not to follow treatment recommendations (AHRQ, 2004).

The committee believes *the hospitalization rate for ambulatory-care-sensitive conditions* is an important indicator of health care quality and effectiveness of public health strategies. AHRQ generates figures for ambulatory care-sensitive conditions and provides tables broken down by demographic groups, however these are not posted on the AHRQ website. Although AHRQ does not generate state level estimates, staff expressed willingness to work with SUSA in providing these numbers. The terminology used by AHRQ for specific condition ACSC hospitalization rates is prevention quality indicator or PQI. There are 14 specific conditions for which ACSC rates (PQIs) are generated. These can be found at http://www.qualityindicators.ahrq.gov/downloads/pqi/pqi_comparative_v31.pdf.

The overall indicator that the committee believes should be used is PQI90. Note that there are also chronic and acute condition summary indicators as well. The committee suggests that this might be a good drill down factor to show on the SUSA website.

The PQI measures are generated using hospital discharge data from the Healthcare Cost and Utilization project (HCUP). HCUP receives data from only 41 states, which represent about 90 percent of the U.S. population. Data can be analyzed by age, median household income for patient ZIP code, race, and sex.

The Social and Physical Environment

Social and physical determinants play a particularly important role in health in that they impact health outcomes directly as well as indirectly by influencing the other determinants. Social and physical determinants include SES, race/ethnicity, social support, health literacy and limited English proficiency, and the social and physical environment in which people live, learn, work, and play.

Socioeconomic status is one of the most important determinants of health. People who are poor are less likely to have access to healthy foods and healthy environments, more likely to be exposed to stressors and health risks, and more likely to be uninsured and not receive preventive health screenings, and as a result, have worse health outcomes than people not in poverty (Adler et al., 2007). Income inequality also has been shown to have a significant impact on health. Important concepts to measure in this area include income, education, and employment status. Others determinants include wealth, job classification (e.g., white collar versus blue collar), and housing status.

Even after controlling for socioeconomic status, race remains a significant predictor of health outcomes and access to care. Many health-related disparities are likely affected only modestly by genetics, instead being more strongly influenced by environmental factors such as dietary differences and inequities in the provision of health care services (Bamshad, 2005; Olden and White, 2005). Indeed, the link between health on the one hand and race/ethnicity and SES on the other are so important that an entire section of this report, the disparities section, has been devoted to these links.

Social support, including committed long-term relationships, supportive friends, and other relationships, provide protection for individuals' health (Berkman and Glass, 2000; Kawachi and Berkman, 2001; Stansfeld, 1999). Social support can be obtained through numerous sources including marriage, family and friends, religious attendance, and community involvement.

Health literacy is "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan and Parker, 2000). Health literacy affects one's ability to navigate the health care system including locating providers, completing forms, sharing health history information, understanding the connection between risky behaviors and health, managing chronic conditions, and understanding directions—both for taking medicines and for self-management of conditions (HRSA, 2008; IOM, 2004a; ODPHP, 2008). More than 90 million U.S. adults (47 percent of the population) have trouble understanding and acting on health information (IOM, 2004a). In the 2003 National Assessment of Adult Literacy supplement on health literacy, only 12 percent of U.S. adults scored in the proficient range[9] (AHRQ, 2008a,b).

Many health outcomes are linked to features of the physical environment such as air and water quality, temperature, and characteristics of the built environment. For example, physical environmental factors such as poor housing and increased levels of pollution have been shown to lead to increased risk for lower respiratory tract symptoms and asthma (Gauderman et al., 2004; IOM, 2000a). The link between the built environment and health is an active area of research. Examples of built environment features associated with health include availability of parks and other recreation spaces, and the quality of housing.

The social environment in which people live, learn, work, and play has an important impact on health. Researchers are focusing their efforts on understanding the relationships between the two. Factors such as crime, social capital, civic engagement, homeownership, social and behavioral norms, and segregation, to name a few, have all been shown to have an impact on health.

Although these social and physical characteristics are fundamental determinants of health, the committee did not include them in the list of 20 health/health care indicators because it anticipates that, with the exception of social support and health literacy and limited English proficiency, they will be covered in other SUSA domains.[10] For example, the committee believes it is highly likely that the economy domain will include indicators for employment and income, that the environmental domain will include indicators of air and water quality and toxic hazards, and that the education domain will have indicators related to educational attainment. Therefore, the committee determined that it was best not to include items such as individual indicators within the health/health care

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[9] Health literacy levels in the NAAL are *below basic* (able to perform tasks such as signing a form or adding the amounts on a bank deposit slip), *basic* (reading and understanding information in simple documents), *intermediate* (locating information in dense, complex documents), and *proficient* (integrating, synthesizing, and analyzing multiple pieces of information from complex documents).

[10] The committee has been given to understand that the SUSA website may include the following domains: Demographics—Life Stages; Demographics—Geographic Distribution and Mobility; the Economy; Health; Education; the Environment; Civic and Cultural Vitality; Housing; Infrastructure; Energy; Innovative Capacity; Public Safety and National Security; America's Role in the World.

domain. Rather, the committee believes strongly that as indicators for other domains are developed, those relevant to health as outlined above should be clearly linked to the health domain and basic information put there as a placeholder until the links can become active. In the case of social support and health literacy and limited English proficiency, the committee would have liked to have included these as indicators but was unable to identify an appropriate measure. To a degree, drill-down capabilities in SUSA will allow users to make connections between some aspects of the social environment and health outcomes, particularly to the extent that data can be displayed when stratified by income and education.

DISPARITIES

In addition to the 20 indicators discussed in the preceding pages, the committee concluded that identifying disparities, both socioeconomic and those associated with race/ethnicity, is crucial to a better understanding of the determinants of health and health outcomes. Disparities (also referred to as differences or inequalities) might be broadly defined as differences among groups. (For health *care*, these might be further qualified as those differences that are not explainable by clinically accepted factors defining need for or appropriateness of particular services.) Measures of disparities in health as well as other domains of interest to SUSA are of crucial interest for a number of reasons: (1) as indications of lack of equity in the distribution of the benefits of our society, (2) as clues to the reasons for poor overall performance in particular domains, and (3) as pointers to areas in which targeted action may be needed to improve performance for specific groups and for the nation as a whole.

The charge to the committee explicitly mentions disparities as one of the areas to be included in reports. However, the committee's approach to disparities is somewhat different from that taken for the topics listed in the indicators section of this report. The differences arise because an indicator of disparity generally pertains to a specific indicator that might also be considered at a national level. Thus, indicators of disparities represent ways of viewing or analyzing the same data that also enter into general indicators, rather than an entirely distinct set of indicators. For example, life expectancy at birth is a potential indicator of national health, while differences in life expectancy at birth across groups are indicators of disparities in health.

In general, if an indicator is important to consider in relation to disparities, its overall level is likely to be important as well; indeed the very existence of a disparity implies that the overall national level for the corresponding indicator is probably not optimal. Thus, rather than listing a distinct set of indicators for disparities, the committee believes that the disparity indicators are best derived from a subset of the national indicators. This section focuses on the methodology for creating disparities indicators given the choice of the general indicators from which they are derived. Suitability for calculation of disparities is also a criterion that was considered in the choice of these indicators.

The approach in the remainder of this section is fairly general. Much of what is suggested here might be applicable in other topic sections of the SUSA site where inter-group differences would also be of interest.

Disparity Groups

An analysis of disparities is essentially a comparison of population subgroups; the choice of these subgroups therefore shapes the discussion and presentation of disparities.

In the United States, disparities are most frequently calculated and presented in terms of differences among racial/ethnic groups. (The hybrid term "racial/ethnic" is used both because the category "Hispanic ethnicity" is a feature of common U.S. "racial" classifications, and to emphasize that "race" itself as commonly understood and measured is a social rather than biological construct.) There are a number of reasons for this focus, including (1) the key role of race/ethnicity, and in particular historical and persistent racial inequities, in American society, (2) the well-known existence of disparities by race/ethnicity in many dimensions, (3) the fact that race/ethnicity is commonly collected as a data item in many statistical systems including surveys and vital records, and (4) the extent to which racial/ethnic identification is regarded as an immutable personal characteristic.

Race/ethnicity is commonly recorded in federal data systems according to the categories established by the Office of Management and Budget (OMB), although the OMB categories have changed over time (most recently being substantially revised in 1997 to allow multiple-race reporting) (NRC, 2004). However, when the data are available and sample sizes are adequate, it is also desirable to report measures for more precisely described ethnic groups. One example is to report for Mexican-Americans and Cuban-Americans as well as subsuming both into a single heterogeneous Hispanic category, or distinguishing different Asian-American national origins.

The committee believes that where possible disparities should also be reported by socioeconomic status (SES). Although less common in the United States than elsewhere (especially the UK and elsewhere in the European Union), disparities reporting by SES is important because (1) differences by SES are often larger than those by race, (2) a unique emphasis on racial/ethnic disparities can give a misleading sense of the mechanisms underlying them, and, therefore, (3) the two kinds of disparities might point to different solutions.

SES can be represented by several different measures; the most common include income and education. Income is the most direct measure of resources but is mutable over the life course and less often collected on surveys than education, while education captures other aspects of status and is relatively constant over the adult life course. Furthermore, either of these measures might be collected at either the individual or geographical area level (census tract, ZIP code area; see further discussion below). The exact choice of SES measure for reporting SES disparities for any particular outcome may be determined largely by availability in the data source for that outcome. Advantages and disadvantages of various SES measures are discussed in *Eliminating Health Disparities: Measurement and Data Needs* (NRC, 2004).

Reporting by a combination (cross-classification) of race/ethnicity and SES can also be informative by showing the independent contributions of race/ethnicity and SES to disparities. Figure 3 provides an example from a New York City report which shows major differences by income category within each racial/ethnic group. This type of display might be offered as an additional drill-down when there are adequate data.

There is ample evidence of geographical disparities in health, health care, and determinants of health. Rural residents are more likely to be elderly, poor, in worse health, and to have chronic conditions than are their urban counterparts (AHRQ, 2006). The National Rural Health Association reports that, "Economic factors, cultural and social differences,

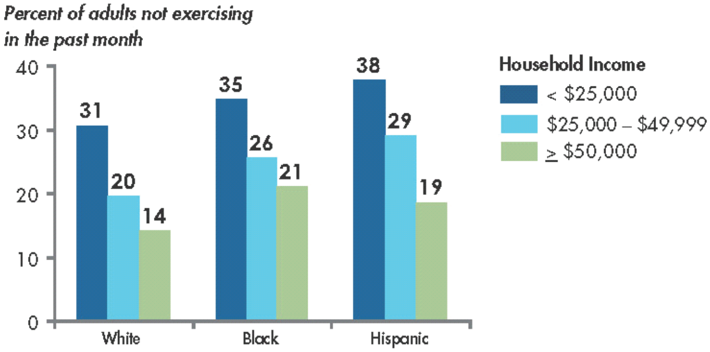

FIGURE 3 Income disparities in exercise rates.
SOURCE: Karpati et al., 2004.

educational shortcomings, lack of recognition by legislators and the sheer isolation of living in remote rural areas all conspire to impede rural Americans in their struggle to lead a normal, healthy life" (NRHA, 2008). According to the Rural Assistance Center (2008), rural residents are less likely to have employer-provided health care coverage or to be covered by Medicaid if they are poor, alcohol abuse is a significant problem, deaths from unintentional injuries other than motor vehicle accidents are twice as common among rural residents, and while 20 percent of America's population lives in rural communities, less than 10 percent of physicians practice in those communities. In addition to these urban-rural differences, there are also differences by geographical region in health and health care. For example, there are major regional differences in smoking and alcohol consumption (SAMHSA, 2006a; Wright and Sathe, 2006) as well as in health care expenditures and quality (Fisher et al., 2003a,b).

For these reasons, geographic disparities are also important, but not every geographic difference should be presented in the disparities framework. Only those that represent *systematic* differences among areas, such as rural-urban differences or broad regional differences should be included in the framework. Other geographic drill-downs might be made available (when data are adequate) because local information is appealing and informative to users of the SUSA site. For example, if one town has a better hospital than another, that might lead to geographic difference in health care quality that is interesting to people in those towns. But such nonsystematic effects should not be highlighted in the same way as systematic disparities by race, SES, or broad geographic groupings.

While the focus here is on disparities by race/ethnicity, SES, and geographic region (including rural/urban differences), it should be noted that other types of differences that are not always regarded as disparities might be analyzed and presented in a similar manner when data are available that make this possible, such as differences by limited English proficiency, date of immigration, or gender.

Indicators to Be Included in Disparities Reporting

Any indicator that is measured at the individual level can also be analyzed for disparities, as long as the data source can be linked to data on race/ethnicity and/or a measure of SES. This includes measures of behavior, health outcomes, health care, and some social factors. Environmental factors and social factors operating at a neighborhood or community level might be analyzed for disparities by considering differences between categories of areas defined by disparity groups (e.g., areas of concentrated minority populations versus predominantly white areas, high- versus low-median-income areas), or by averaging the conditions experienced by a group (e.g., percentage of members of a racial/ethnic group residing in an area with unsafe water). The committee notes appropriateness for disparity reporting in the section on each of the proposed indicators.

Conceptual and Measurement Issues for Disparities Reporting

When to Control and for What

The simplest analytic approach for reporting a disparity is to calculate the differences between outcomes for the groups being compared (where outcomes are used generically to refer to measures of health, health care, or other measured quantities). However, it will sometimes be more appropriate to control for other variables to make meaningful comparisons. For example, each disease or disorder has a distribution of age of incidence (and prevalence by age) and it would be misleading to report that a group had a lower rate of a disease simply because it had a lower proportion in the most vulnerable age range. Similarly, some processes and outcomes of health care are only relevant to particular clinical groups and might be more likely to be clinically appropriate, present, or positive for patients with certain age, sex, or clinical characteristics.

To some extent, appropriate controls are built into the measures. For example, life-table estimates of life expectancy automatically adjust for age distribution. Measures of quality of health care typically are designed to apply only to the relevant clinical population. However, in some cases explicit adjustments might have to be made. Sometimes these will involve standard methods of presentation (such as age-standardized incidence or mortality rates) and others might require more explicit modeling (regression adjustments).

The choice of variables for which to adjust has been somewhat controversial. There is little controversy about adjustments for age and sex. Similarly, there is some agreement that a measure of health care processes might be adjusted for clinical variables such as severity of illness. However, the committee believes that displays of racial/ethnic disparities should not be adjusted for income or other SES variables. (This position is stated in the Institute of Medicine report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* [IOM, 2003b; McGuire et al., 2006].) The basis of this belief is that differences in income and other aspects of SES are part of the social disadvantage that a racial/ethnic group might experience; controlling for SES variables therefore corresponds to an unrealistic hypothetical world in which such disadvantages have been eliminated, rather than describing the current situation of the racial/ethnic group. A possible exception might be a display in which both racial/ethnic and SES variables are used to form groups (e.g., a bar chart in which each bar represents an income group within a specific race/ethnicity, as in Figure 3); such a display allows the viewer to separate racial/ethnic and SES aspects of disparity, while avoiding masking of the "main effects" differences.

The committee understands that SUSA does not intend to conduct its own analyses and therefore choices about adjustment are limited to options available in data sets already prepared (or potentially created in the future) by authoritative sources. Nonetheless, these guidelines about adjustment should be considered as criteria in the choice of sources.

How to Display and Summarize Disparities

Because disparities are multidimensional (e.g., comparisons of up to six racial/ethnic groups), it is difficult to come up with a single-number summary of the extent of disparity on any given indicator. In general it would be preferable to offer the viewer the comparative information on groups, perhaps as a bar chart (for a single indicator) or a line graph with multiple lines (for trends over time), with tabular backup to allow access to specific numbers. A benefit of this approach is that the viewer can see results for any particular subgroup of interest.

If a single summary of disparities needs to be presented in some parts of the site, one such number might be a contrast of the most-advantaged to least-advantaged group. The National Healthcare Disparities Report (AHRQ, 2006) uses comparisons of each group to the most-advantaged group to describe disparities. Such contrasts might be expressed in several ways. For example, for an outcome with a low rate (e.g., incidence of a particular type of disease, a rare adverse outcome, failure to obtain a service or treatment that is nearly always provided when appropriate), a ratio might be appropriate (reflecting ratios of adverse reports, with the most favored group's rate taken as 100 percent). If the good outcome is rare (e.g., use of a new and still unusual technology) then ratios for the good outcome would be more appropriate. Ratios are often an interpretable presentation for quantities such as expenditures or costs incurred, as well. For rates that are in the "middle" range (say, 20 to 80 percent), an absolute difference in rates is often more interpretable.

Individual and Area-level Measures of Characteristics

Some datasets will contain information on relevant grouping characteristics (such as race/ethnicity or SES) at the individual level. Others do not include this information, but can be linked to geographically-based datasets (usually from the census) containing area measures such as median household income, percentage in poverty, percentage with college education, or percentage with limited English proficiency. (Group differences that are inherently based on geography, such as regional or urban/rural differences, or outcomes that are inherently area-based such as crime or pollution levels are not considered here.) Depending on the geographical information in the data, such linkages might be made at very detailed (block or block group) to less detailed (ZIP Code tabulation area) levels.

Use of area-based measures is widespread in epidemiology and health services research; methodological findings from this research are summarized on the website of the Public Health Disparities Geocoding Project at the Harvard School of Public Health (http://www.hsph.harvard.edu/thegeocodingproject/) and see also *Using Area-Based Socioeconomic Measures to Study Social Disparities in Cancer* (Krieger, 2006). In general, estimates of differences or disparities between groups using such area measures will not be the same as for those based on individual-level measures, although they are more similar when the areas are small and more homogeneous than when they are large and more diverse. However, differences based on area measures are nonetheless real disparities. For example, a difference in outcome between high-poverty areas and low-poverty areas raises similar concerns to a difference in outcome between poor and non-poor individuals. Furthermore, area-level comparisons might reveal some effects that are not evident in individual-level analyses. For example, poor households in an area of high poverty might suffer worse outcomes than households of similar income in a low-poverty area that has better access to services and lower levels of environmental stressors.

In general it is best to form groups based on individual- or household-level measures, when available, simply because they are simpler to explain and understand. However, when area-level grouping measures are the only data available, the committee does endorse their use with the best or only data source for an outcome. In either case, the display should include (or link to) information about the type of data used to form groups, with group labels such as "poverty households" or "high-poverty areas" as appropriate.

How Disparities Might Be Featured on the Website

Although the committee's approach does not result in a distinct set of indicators for disparities, this should not be allowed to stand in the way of making disparities information prominent and readily accessible. Rather, the hypertext capabilities of the website should be exploited to allow the viewer multiple routes for finding the way to disparities information. In particular, every page devoted to a specific indicator could include a link to the corresponding display of disparities. (The link could be labeled something like "see racial disparities for X" or even better, "racial disparities, click here for details.") As another route to the same information, the main page for health indicators could also have a link to a disparities page containing the list of relevant indicators with a summary measure of disparity for each and a link to the page giving the detailed disparity information. The committee does not consider it appropriate to be more specific at this point given the thought that must go into a successful web design, but hopes that these ideas will convey the way that the committee sees disparities information being woven into the site, corresponding to the way that disparities are in the "real world" woven into all aspects of health and its determinants.

RECOMMENDATIONS

The following section presents the committee's recommendations. Indicators within the health/health care domain were selected because of their importance to health or health care; because reliable, high-quality data are available to measure change in the indicators over time; because the data can be viewed by population subgroups or geographic region; and because the committee believes that the chosen indicators reflect the overall health of the nation and the effectiveness and efficiency of U.S. health systems.

The committee recommends that the State of the USA website include the following indicators for the health/health care domain:

Health Outcomes

- **Life expectancy at birth: Number of years that a newborn is expected to live if current mortality rates continue to apply**
- **Infant mortality: Deaths of infants aged under 1 year per 1,000 live births**
- **Life expectancy at age 65: Number of years of life remaining to a person at age 65 if current mortality rates continue to apply**
- **Injury related mortality: Age-adjusted mortality rates due to intentional and unintentional injuries**
- **Self-reported health status: Percentage of adults reporting fair or poor health**
- **Unhealthy days physical and mental: Mean number of physically or mentally unhealthy days in past 30 days**
- **Chronic disease prevalence: Percentage of adults reporting one or more of six chronic diseases (diabetes, cardiovascular disease,**

chronic obstructive pulmonary disease [chronic bronchitis and emphysema], asthma, cancer, and arthritis)

- Serious psychological distress: Percentage of adults with serious psychological distress as indicated by a score of ≥ 13 on the K6 scale

Health-Related Behaviors

- Smoking: Percentage of adults who have smoked ≥ 100 cigarettes in their lifetime and who currently smoke some days or every day
- Physical Activity: Percentage of adults meeting the recommendation for moderate physical activity (at least 5 days a week for 30 minutes a day of moderate-intensity activity or at least 3 days a week for 20 minutes a day of vigorous-intensity activity)
- Excessive Drinking: Percentage of adults consuming four (women) or five (men) or more drinks on one occasion and/or consuming more than an average of one (women) or two (men) drinks per day during the past 30 days
- Nutrition: Percentage of adults with a good diet (conformance to federal dietary guidance) as indicated by a score of ≥ 80 on the Healthy Eating Index
- Obesity: Percentage of adults reporting a body mass index of ≥ 30
- Condom use: Proportion of youth in grades 9–12 who are sexually active and who do not use condoms, placing them at risk for sexually transmitted infections

Health Systems

- Health care expenditures: Per capita health care spending
- Insurance coverage: Percentage of adults without health coverage via insurance or entitlement
- Unmet medical, dental, and prescription drug needs: Percentage of (non-institutionalized) people who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year
- Preventive services: Percentage of adults who are up to date with age-appropriate screening services and flu vaccination
- Childhood immunization: Percentage of children aged 19–35 months who are up to date with recommended immunizations
- Preventable hospitalizations: Hospitalization rate for ambulatory-care-sensitive conditions

Social determinants play a particularly important role in health in that they impact health outcomes directly as well as indirectly by influencing other determinants. Social determinants include socioeconomic status (income, education, and employment status), race/ethnicity, social support, health literacy and limited English proficiency, and the social environment in which people live, learn, work, and play. Furthermore, many health outcomes are linked to features of the physical environment such as air and water quality, temperature, and characteristics of the built environment. **Because of the relationship of health to factors in the other domains that SUSA will be developing, the committee recommends that as the other domains in SUSA are developed and indicators become available which describe the important social and physical determinants of health, SUSA should make an effort to create appropriate, dynamic linkages to describe health more fully.**

The committee believes that it is important for the SUSA website to include an explanation of the framework used to develop the indicators for health/health care as introductory material to that domain. **Therefore, the committee recommends that the following description of the framework be included on the website:**

> The indicators in the health domain fall into two categories. The first is health outcomes, which track the health of nations, states, and communities. The second is determinants of health outcomes, in other words, factors that influence health outcomes. In addition to an individual's own biology, there are three main types of health determinants which all interact to influence health outcomes. These determinants are characteristics of the social and physical environment, health-related behaviors, and health systems performance. Although the social and physical environments play a particularly important role in that they influence other determinants, this part of the website presents indicators relating to health outcomes, health-related behaviors, and health systems. Indicators of the social and physical environments can be found in other SUSA domains and can be linked to health.

As discussed earlier, the charge to the committee explicitly mentions disparities as one of the areas to be included in the report. Because disparities are important in the examination of a variety of indicators across many of the domains that SUSA intends to include in its website, the committee believes that disparity indicators are best derived from a subset of the national indicators. **Therefore, the committee recommends that for each indicator in the various SUSA domains, SUSA should include the ability to explore disparities by socioeconomic status, race/ethnicity, and geographic region.**

REFERENCES

AAP (American Academy of Pediatrics), Committee on Substance Abuse and Committee on Children with Disabilities. 2000. Fetal alcohol syndrome and alcohol-related neurodevelopmental disorders. *Pediatrics* 106(2 Pt 1):358–361.

Abma, J. C., G. M. Martinez, W. D. Mosher, and B. S. Dawson. 2004. Teenagers in the United States: Sexual activity, contraceptive use, and childbearing, 2002. *Vital and Health Statistics* 23(24):1–48.

Adler, N., J. Stewart, S. Cohen, M. Cullen, A. D. Roux, W. Dow, G. Evans, I. Kawachi, M. Marmot, K. Matthews, B. McEwen, J. Schwartz, T. Seeman, and D. Williams. 2007. *Reaching for a healthier life: Facts on socioeconomic status and health in the U.S.* The John D. and Catherine T. Macarthur Foundation Research Network on Socioeconomic Status and Health.

AHRQ (Agency for Healthcare Research and Quality). 2004. *Evidence report/technology assessment Number 87: Literacy and health outcomes*. Rockville, MD: HHS.

AHRQ. 2005. *National healthcare quality report*. Rockville, MD: HHS.

AHRQ. 2006. *National healthcare disparities report*. Rockville, MD: HHS.

AHRQ. 2008a. *The guide to clinical preventive services, 2008: Recommendations of the U.S. Preventive Services Task Force*. Rockville, MD: HHS.

AHRQ. 2008b. Only about 1 in 10 adult Americans have all the skills needed to manage their health. *AHRQ News and Numbers* May 14.

Allison, D. B., K. R. Fontaine, J. E. Manson, J. Stevens, and T. B. VanItallie. 1999. Annual deaths attributable to obesity in the United States. *JAMA* 282(16):1530–1538.

Bamshad, M. 2005. Genetic influences on health: Does race matter? *JAMA* 294(8):937–946.

Bergen, G., L. H. Chen, M. Warner, and L. A. Fingerhut. 2008. *Injury in the United States: 2007 chartbook.* Hyattsville, MD: National Center for Health Statistics.

Berkman, L. F., and T. Glass. 2000. Social integration, social networks, social support, and health. In *Social epidemiology*, edited by L. F. Berkman and I. Kawachi. New York: Oxford University Press. Pp. 137–173.

Billings, J., G. M. Anderson, and L. S. Newman. 1996. Recent findings on preventable hospitalizations. *Health Affairs* 15(3):239–249.

Booth, B. M., and W. Feng. 2002. The impact of drinking and drinking consequences on short-term employment outcomes in at-risk drinkers in six southern states. *Journal of Behavioral Health Services & Research* 29(2):157–166.

Bosworth, H. B., I. C. Siegler, B. H. Brummett, J. C. Barefoot, R. B. Williams, N. E. Clapp-Channing, and D. B. Mark. 1999. The association between self-rated health and mortality in a well-characterized sample of coronary artery disease patients. *Medical Care* 37(12):1226–1236.

Boyer, C. B., M. A. Shafer, E. Teitle, C. J. Wibbelsman, D. Seeberg, and J. Schachter. 1999. Sexually transmitted diseases in a health maintenance organization teen clinic: Associations of race, partner's age, and marijuana use. *Archives of Pediatrics and Adolescent Medicine* 153(8):838–844.

Castaneda, R., N. Sussman, L. Westreich, R. Levy, and M. O'Malley. 1996. A review of the effects of moderate alcohol intake on the treatment of anxiety and mood disorders. *Journal of Clinical Psychiatry* 57(5):207–212.

CDC (Centers for Disease Control and Prevention). 1996. *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: HHS, CDC, National Center for Chronic Disease Prevention and Health Promotion.

CDC. 1998. *Sexually transmitted disease surveillance, 1997*. Atlanta, GA: HHS, Public Health Service.

CDC. 1999. Achievements in public health, 1900–1999 impact of vaccines universally recommended for children—United States, 1990–1998. *Morbidity and Mortality Weekly Report* 48(12):243–248.

CDC. 2007a. *Health-related quality of life: Findings*. http://www.cdc.gov/hrqol/findings.htm#key (accessed September 28, 2008).

CDC. 2007b. *Healthier worksite initiative: Selected preventative screening recommendations*. http://www.cdc.gov/nccdphp/dnpa/hwi/resources/screening_matrix.htm (accessed September 30, 2008).

CDC. 2007c. *Nation's childhood immunization rates remain at or above record levels*. http://www.cdc.gov/media/pressrel/2007/r070830.htm (accessed September 25, 2008).

CDC. 2008a. *ACIP recommendations: Introduction and biology of influenza*. http://www.cdc.gov/flu/professionals/acip/background.htm (accessed September 30, 2008).

CDC. 2008b. *Alcohol-related disease impact (ARDI)*. http://www.cdc.gov/alcohol/ardi.htm (accessed September 25, 2008).

CDC. 2008c. *Behavioral Risk Factor Surveillance System prevalence and trends data: Physical activity—2007. Adults with 30+ minutes of moderate physical activity five or more days per week, or vigorous physical activity for 20+ minutes three or more days per week*. http://apps.nccd.cdc.gov/brfss/list.asp?cat=PA&yr=2007&qkey=4418&state=All (accessed November 16, 2008).

CDC. 2008d. *Behavioral Risk Factor Surveillance System prevalence and trends data: Tobacco use—2007. Adults who are current smokers*. http://apps.nccd.cdc.gov/BRFSS/list.asp?cat=TU&yr=2007&qkey=4396&state=All (accessed November 16, 2008).

CDC. 2008e. *Box 2. Summary of influenza vaccination recommendations, 2008: Adults*. http://www.cdc.gov/flu/professionals/acip/flu_vax_adults0809.htm#box2 (accessed September 30, 2008).

CDC. 2008f. *Chronic disease prevention and health promotion*. http://www.cdc.gov/nccdphp/ (accessed September 30, 2008).

CDC. 2008g. *Chronic disease prevention and health promotion: Chronic disease overview*. http://www.cdc.gov/nccdphp/overview.htm (accessed September 30, 2008).

CDC. 2008h. *Influenza vaccination: A summary for clinicians.* http://www.cdc.gov/flu/professionals/vaccination/vax-summary.htm (accessed September 30, 2008).

CDC. 2008i. *Overweight and obesity: Health consequences*. http://www.cdc.gov/nccdphp/dnpa/obesity/consequences.htm (accessed September 28, 2008).

CDC. 2008j. *Targeting arthritis: Improving quality of life for more than 46 million Americans*. Atlanta, GA: HHS.

CDC. 2008k. Update: Measles—United States, January–July 2008. *Morbidity and Mortality Weekly Report* 57(33):893–896.

CDC, NCHSTP (National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention). 2008l. *2006 disease profile*. Washington, DC: HHS.

Census Bureau. 2004. *People with health insurance: A comparison of estimates from two surveys, SIPP Working Paper 243*. Washington, DC: Department of Commerce.

Chapman, D. P., and G. S. Perry. 2008. Depression as a major component of public health for older adults. *Preventing Chronic Disease* 5(1):A22.

Chen, C. M., and H. Yi. 2007. *Trends in alcohol-related morbidity among short-stay community hospital discharges, United States, 1979–2005*. Bethesda, MD: National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism.

Chou, R., A. K. Smits, L. H. Huffman, R. Fu, and P. T. Korthuis. 2005. Prenatal screening for HIV: A review of the evidence for the U.S. Preventive Services Task Force. *Annals of Internal Medicine* 143(1):38–54.

CMS (Centers for Medicare & Medicaid Services). 2008. *National Health Expenditures (NHE) tables*. http://www.cms.hhs.gov/NationalHealthExpendData/downloads/tables.pdf (accessed November 16, 2008).

Congressional Budget Office. 2003. *How many people lack health insurance and for how long?* Washington, DC: Congressional Budget Office.

Corrao, G., L. Rubbiati, A. Zambon, and S. Arico. 2002. Alcohol-attributable and alcohol-preventable mortality in Italy. A balance in 1983 and 1996. *European Journal of Public Health* 12(3):214–223.

Corrao, G., V. Bagnardi, A. Zambon, and C. La Vecchia. 2004. A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine* 38(5):613–619.

Crimmel, B. L., and M. N. Stagnitti. 2005. *Prescription drugs: Out-of-pocket expenses and unmet need relative to family income, 2002*, *Statistical brief #102*. Rockville, MD: AHRQ.

Cunningham, P. J., and L. E. Felland. 2008. Falling behind: Americans' access to medical care deteriorates, 2003–2007. *Tracking Report* 19(June 2008).

Dahlgren, G., and M. Whitehead. 1991. *Policies and strategies to promote social equity in health*. Stockholm: Institute for the Future Studies.

DHEW (Department of Health, Education, and Welfare). 1979. *Healthy people: The Surgeon General's report on health promotion and disease prevention*. Washington, DC: Government Printing Office.

Dietary Guidelines Advisory Committee. 2005. *Report of the Dietary Guidelines Advisory Committee on the dietary guidelines for Americans, 2005*. http://www.health.gov/dietaryguidelines/dga2005/report/default.htm (accessed September 28, 2008).

Dorn, S. 2008. *Uninsured and dying because of it: Updating the Institute of Medicine analysis on the impact of uninsurance on mortality*. Washington, DC: Urban Institute.

Eurosurveillance Editorial Team. 2008. Measles once again endemic in the United Kingdom. *Eurosurveillance* 13(27).

Evans, R. G., and G. L. Stoddart. 1990. Producing health, consuming health care. *Social Sciences and Medicine* 31(12):1347–1363.

Fielding, J. E., C. G. Husten, and M. P. Eriksen. 1998. Tobacco: Health effects and control. In *Public health and preventive medicine*. 14th ed., edited by K. F. Maxcy, M. J. Rosenau, J. M. Last and R. B. Wallace. Stamford, CT: Appleton & Lange.

Filia, A., M. De Crescenzo, T. Seyler, A. Bella, M. L. Ciofi Degli Atti, L. Nicoletti, F. Magurano, and S. Salmaso. 2008. Measles resurges in Italy: Preliminary data from September 2007 to May 2008. *Eurosurveillance* 13(29).

Fisher, E. S., D. E. Wennberg, T. A. Stukel, D. J. Gottlieb, F. L. Lucas, and E. L. Pinder. 2003a. The implications of regional variations in Medicare spending. Part 1: The content, quality, and accessibility of care. *Annals of Internal Medicine* 138(4):273–287.

Fisher, E. S., D. E. Wennberg, T. A. Stukel, D. J. Gottlieb, F. L. Lucas, and E. L. Pinder. 2003b. The implications of regional variations in Medicare spending. Part 2: Health outcomes and satisfaction with care. *Annals of Internal Medicine* 138(4):288–298.

Flegal, K. M., M. D. Carroll, C. L. Ogden, and C. L. Johnson. 2002. Prevalence and trends in obesity among U.S. adults, 1999–2000. *JAMA* 288(14):1723–1727.

Flegal, K. M., B. I. Graubard, D. F. Williamson, and M. H. Gail. 2007. Cause-specific excess deaths associated with underweight, overweight, and obesity. *JAMA* 298(17):2028–2037.

Forhan, S. E., S. L. Gottlieb, M. R. Sternberg, F. Xu, S. D. Datta, S. Berman, and L. E. Markowitz. 2008 (March 13). *Prevalence of sexually transmitted infections and bacterial vaginosis among female adolescents in the United States: Data from the National Health and Nutrition Examination Survey (NHANES) 2003–2004*. Paper presented at 2008 National STD Prevention Conference, Chicago, IL.

Gauderman, W. J., E. Avol, F. Gilliland, H. Vora, D. Thomas, K. Berhane, R. McConnell, N. Kuenzli, F. Lurmann, E. Rappaport, H. Margolis, D. Bates, and J. Peters. 2004. The effect of air pollution on lung development from 10 to 18 years of age. *New England Journal of Medicine* 351(11):1057–1067.

Gold, M., P. Franks, and P. Erickson. 1996. Assessing the health of the nation. The predictive validity of a preference-based measure and self-rated health. *Medical Care* 34(2):163–177.

Greenfeld, L. A. 1998. *Alcohol and crime: An analysis of national data on the prevalence of alcohol involvement in crime.* Washington, DC: U.S. Department of Justice, Bureau of Justice Statistics.

Grzywacz, J. G., and J. Fuqua. 2000. The social ecology of health: Leverage points and linkages. *Behavioral Medicine* 26(3):101–115.

Hagman, B. T., C. D. Delnevo, M. Hrywna, and J. M. Williams. 2008. Tobacco use among those with serious psychological distress: Results from the National Survey of Drug Use and Health, 2002. *Addictive Behaviors* 33(4):582–592.

Hall, H. I., R. Song, P. Rhodes, J. Prejean, Q. An, L. M. Lee, J. Karon, R. Brookmeyer, E. H. Kaplan, M. T. McKenna, and R. S. Janssen. 2008. Estimation of HIV incidence in the United States. *JAMA* 300(5):520–529.

Harper, S., J. Lynch, S. Burris, and G. Davey Smith. 2007. Trends in the black-white life expectancy gap in the United States, 1983–2003. *JAMA* 297(11):1224–1232.

Heron, M. 2007. Deaths: Leading causes for 2004. *National Vital Statistics Reports* 56(5):1–95.

Heslin, K. C., W. E. Cunningham, M. Marcus, I. Coulter, J. Freed, C. Der-Martirosian, S. A. Bozzette, M. F. Shapiro, S. C. Morton, and R. M. Andersen. 2001. A comparison of unmet needs for dental and medical care among persons with HIV infection receiving care in the United States. *Journal of Public Health Dentistry* 61(1):14–21.

HHS (Department of Health and Human Services). 1989. *Reducing the health consequences of smoking: 25 years of progress. A report of the Surgeon General*. Rockville, MD: HHS, Public Health Service, CDC.

HHS. 1998. *Tobacco use among U.S. Racial/ethnic minority groups: African Americans, American Indians and Alaska natives, Asian Americans and Pacific Islanders, and Hispanics. A report of the Surgeon General*. Atlanta, GA: HHS, CDC.

HHS. 2000. *Healthy people 2010: Understanding and improving health.* 2nd ed. Washington, DC: U.S. Government Printing Office.

HHS. 2001. *Women and smoking: A report of the Surgeon General*. Rockville, MD: HHS, CDC.

HHS. 2004. *The health consequences of smoking: A report of the Surgeon General*. Atlanta, GA: HHS, CDC.

HHS and USDA. 2005. *Dietary guidelines for Americans, 2005*. Washington, DC: U.S. Government Printing Office.

HRSA (Health Resources and Services Administration). 2008. *Health literacy*. http://www.hrsa.gov/healthliteracy/ (accessed September 28, 2008).

Human Resources and Social Development Canada. 2008. *Indicators of well-being in Canada*. http://www4.hrsdc.gc.ca/indicator.jsp?indicatorid=3&lang=en (accessed September 30, 2008).

Humphrey, L. L., M. Helfand, B. K. Chan, and S. H. Woolf. 2002. Breast cancer screening: A summary of the evidence for the U.S. Preventive services task force. *Annals of Internal Medicine* 137(5 Part 1):347–360.

Idler, E. L., and Y. Benyamini. 1997. Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior* 38(1):21–37.

Idler, E. L., and S. V. Kasl. 1995. Self-ratings of health: Do they also predict change in functional ability? *Journals of Gerontology: Series B, Psychological Sciences and Social Sciences* 50(6):S344–S353.

Idler, E. L., S. V. Kasl, and J. H. Lemke. 1990. Self-evaluated health and mortality among the elderly in New Haven, Connecticut, and Iowa and Washington counties, Iowa, 1982–1986. *American Journal of Epidemiology* 131(1):91–103.

IOM (Institute of Medicine). 1999. *Gulf war veterans: Measuring health*. Washington, DC: National Academy Press.

IOM. 2000a. *Clearing the air: Asthma and indoor air exposures*. Washington, DC: National Academy Press.

IOM. 2000b. *Promoting health: Intervention strategies from social and behavioral research*. Washington, DC: National Academy Press.

IOM. 2000c. *To err is human: Building a safer health system*. Washington, DC: National Academy Press.

IOM. 2001. *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: National Academy Press.

IOM. 2003a. *The future of the public's health in the 21st century*. Washington, DC: The National Academies Press.

IOM. 2003b. *Unequal treatment: Confronting racial and ethnic disparities in health care*. Washington, DC: The National Academies Press.

IOM. 2003c. *Who will keep the public healthy?: Educating public health professionals for the 21st century*. Washington, DC: The National Academies Press.

IOM. 2004a. *Health literacy: A prescription to end confusion*. Washington, DC: The National Academies Press.

IOM. 2004b. *Insuring America's health: Principles and recommendations*. Washington, DC: The National Academies Press.

IOM. 2006. *Genes, behavior, and the social environment: Moving beyond the nature/nurture debate*. Washington, DC: The National Academies Press.

Kaiser Commission on Medicaid and the Uninsured. 2008. *Five basic facts on the uninsured*. Washington, DC: Henry J. Kaiser Family Foundation.

Kant, A. K., B. I. Graubard, and A. Schatzkin. 2004. Dietary patterns predict mortality in a national cohort: The national health interview surveys, 1987 and 1992. *Journal of Nutrition* 134(7):1793–1799.

Kaplan, G. A., S. A. Everson, and J. W. Lynch. 2000. The contribution of social and behavioral research to an understanding of the distribution of disease: A multilevel approach. In *Promoting health: Intervention strategies from social and behavioral research*, edited by B. D. Smedley and S. L. Syme. Washington, DC: National Academy Press.

Karpati, A., B. Kerker, F. Mostashari, T. Singh, A. Hajat, L. Thorpe, M. Bassett, K. Henning, and T. Frieden. 2004. *Health disparities in New York City*. New York: New York City Department of Health and Mental Hygiene.

Kawachi, I., and L. F. Berkman. 2001. Social ties and mental health. *Journal of Urban Health* 78(3):458–467.

Kennedy, B. P., I. Kawachi, R. Glass, and D. Prothrow-Stith. 1998. Income distribution, socioeconomic status, and self-rated health in the United States: Multilevel analysis. *British Medical Journal* 317(7163):917–921.

Kessler, R. C., P. R. Barker, L. J. Colpe, J. F. Epstein, J. C. Gfroerer, E. Hiripi, M. J. Howes, S. L. Normand, R. W. Manderscheid, E. E. Walters, and A. M. Zaslavsky. 2003. Screening for serious mental illness in the general population. *Archives of General Psychiatry* 60(2):184–189.

Kim, J. 2008. Psychological distress and occupational injury: Findings from the national health interview survey 2000–2003. *Journal of Preventive Medicine and Public Health* 41(3):200–207.

Kindig, D. A., Y. Asada, and B. Booske. 2008. A population health framework for setting national and state health goals. *JAMA* 299(17):2081–2083.

Krieger, N. 2006. Using area-based socioeconomic measures to study social disparities in cancer. *AACR Meeting Abstracts* 2006(1):1359–1360.

Kung, H. C., D. L. Hoyert, J. Xu, and S. L. Murphy. 2008. Deaths: Final data for 2005. *National Vital Statistics Reports* 56(10):1–120.

Lalonde, M. 1974. *A new perspective on the health of Canadians*. Ottawa: Ministry of Supply and Services.

Last, J. M. 2001. *A dictionary of epidemiology*. 4th ed. New York: Oxford University Press.

Lee, Y. 2000. The predictive value of self assessed general, physical, and mental health on functional decline and mortality in older adults. *Journal of Epidemiology and Community Health* 54(2):123–129.

Leonard, K. E., and J. C. Rothbard. 1999. Alcohol and the marriage effect. *Journal of Studies on Alcohol Supplement* 13:139–146.

Long, S. K., T. A. Coughlin, and S. J. Kendall. 2002. Unmet need among rural Medicaid beneficiaries in Minnesota. *Journal of Rural Health* 18(3):437–446.

Long, S. K., J. King, and T. A. Coughlin. 2005. The implications of unmet need for future health care use: Findings for a sample of disabled Medicaid beneficiaries in New York. *Inquiry* 42(4):413–420.

Maciosek, M. V., L. I. Solberg, A. B. Coffield, N. M. Edwards, and M. J. Goodman. 2006. Colorectal cancer screening: Health impact and cost effectiveness. *American Journal of Preventive Medicine* 31(1):80–89.

McCaig, L. F., and C. W. Burt. 2005. National hospital ambulatory medical care survey: 2003 emergency department summary. *Advance Data From Vital and Health Statistics* (358):1–37.

McGee, D. L., Y. Liao, G. Cao, and R. S. Cooper. 1999. Self-reported health status and mortality in a multiethnic U.S. cohort. *American Journal of Epidemiology* 149(1):41–46.

McGinnis, J. M., and W. H. Foege. 1993. Actual causes of death in the United States. *JAMA* 270(18):2207–2212.

McGuire, T. G., M. Alegria, B. L. Cook, K. B. Wells, and A. M. Zaslavsky. 2006. Implementing the Institute of Medicine definition of disparities: An application to mental health care. *Health Services Research* 41(5):1979–2005.

Meara, E. R., S. Richards, and D. M. Cutler. 2008. The gap gets bigger: Changes in mortality and life expectancy, by education, 1981–2000. *Health Affairs* 27(2):350–360.

Mental Health America. 2007. *Ranking America's mental health: An analysis of depression across the states*. Alexandria, VA: Mental Health America.

Miilunpalo, S., I. Vuori, P. Oja, M. Pasanen, and H. Urponen. 1997. Self-rated health status as a health measure: The predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. *Journal of Clinical Epidemiology* 50(5):517–528.

Mokdad, A. H. 2005. Correction: Actual causes of death in the United States, 2000. *JAMA* 293(3):293–294.

Mokdad, A. H., J. S. Marks, D. F. Stroup, and J. L. Gerberding. 2004. Actual causes of death in the United States, 2000. *JAMA* 291(10):1238–1245.

Montonen, J., P. Knekt, T. Harkanen, R. Jarvinen, M. Heliovaara, A. Aromaa, and A. Reunanen. 2005. Dietary patterns and the incidence of type 2 diabetes. *American Journal of Epidemiology* 161(3):219–227.

Moum, T. A. 1999 (July 28). *Health-related quality of life in Norway—a nationwide mixed-mode panel study of the CDC healthy days measures*. Paper presented at CDC Quality of Life Seminar, Atlanta, GA.

Naimi, T. S., L. E. Lipscomb, R. D. Brewer, and B. C. Gilbert. 2003. Binge drinking in the preconception period and the risk of unintended pregnancy: Implications for women and their children. *Pediatrics* 111(5 Part 2):1136–1141.

National Center on Addiction and Substance Abuse at Columbia University. 1999. *No safe haven: Children of substance-abusing parents*. New York: National Center on Addiction and Substance Abuse at Columbia University.

NCHS (National Center for Health Statistics). 2007. *Health, United States, 2007: With chartbook on trends in the health of Americans*. Hyattsville, MD: HHS.

Newacheck, P. W., D. C. Hughes, Y. Y. Hung, S. Wong, and J. J. Stoddard. 2000. The unmet health needs of America's children. *Pediatrics* 105(4 Pt 2):989–997.

Newschaffer, C. J. 1998. *Validation of behavioral risk factor surveillance system (BRFSS) HRQOL measures in a statewide sample*. Atlanta, GA: CDC.

NIS (National Immunization Survey). 2007a. *Estimated vaccination coverage with individual vaccines and selected vaccination series among children 19–35 months of age by poverty level and race/ethnicity*. http://www2a.cdc.gov/nip/coverage/nis/nis_iap.asp?fmt=r&rpt=tab32_pov_race&qtr=Q1/2007-Q4/2007 (accessed September 25, 2008).

NIS. 2007b. *Estimated vaccination coverage with individual vaccines and selected vaccination series among children 19–35 months of age by state and local area, q1/2007–q4/2007*. http://www2a.cdc.gov/nip/coverage/nis/nis_iap.asp?fmt=v&rpt=tab02_antigen_iap&qtr=Q1/2007-Q4/2007 (accessed September 25, 2008).

NRC (National Research Council). 2004. *Eliminating health disparities: Measurement and data needs*. Washington, DC: The National Academies Press.

NRHA (National Rural Health Association). 2008. *What's different about rural health care?* http://www.ruralhealthweb.org/go/left/about-rural-health/what-s-different-about-rural-health-care (accessed November 16, 2008).

Ockene, I. S., and N. H. Miller. 1997. Cigarette smoking, cardiovascular disease, and stroke: A statement for healthcare professionals from the American Heart Association. American Heart Association Task Force on Risk Reduction. *Circulation* 96(9):3243–3247.

ODPHP (Office of Disease Prevention and Health Promotion). 2008. *Quick guide to health literacy: Fact sheet*. http://www.health.gov/communication/literacy/quickguide/factsbasic.htm (accessed September 28, 2008).

Office of the Surgeon General. 2007. *Overweight and obesity: Health consequences*. http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.htm (accessed September 27, 2008).

Ogden, C. L., M. D. Carroll, L. R. Curtin, M. A. McDowell, C. J. Tabak, and K. M. Flegal. 2006. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA* 295(13):1549–1555.

Ogden, C. L., M. D. Carroll, M. A. McDowell, and K. M. Flegal. 2007. *Obesity among adults in the United States—no statistically significant change since 2003–2004*. No. 1, NCHS data brief. Hyattsville, MD: CDC, National Center for Health Statistics.

Olden, K., and S. L. White. 2005. Health-related disparities: Influence of environmental factors. *Medical Clinics of North America* 89(4):721–738.

Pappas, G., W. C. Hadden, L. J. Kozak, and G. F. Fisher. 1997. Potentially avoidable hospitalizations: Inequalities in rates between US socioeconomic groups. *American Journal of Public Health* 87(5):811–816.

Pijls, L. T., E. J. Feskens, and D. Kromhout. 1993. Self-rated health, mortality, and chronic diseases in elderly men. The Zutphen Study, 1985–1990. *American Journal of Epidemiology* 138(10):840–848.

Pratt, L. A., A. N. Dey, and A. J. Cohen. 2007. Characteristics of adults with serious psychological distress as measured by the K6 scale: United States, 2001–04. *Advance Data From Vital and Health Statistics* (382):1–18.

Ratzan, S. C., and R. M. Parker. 2000. Introduction. In *Current bibliographies in medicine: Health literacy*, edited by C. R. Selden, M. Zorn, S. C. Ratzan, and R. M. Parker. Bethesda, MD: HHS, National Institutes of Health, National Library of Medicine.

Rehm, J., G. Gmel, C. T. Sempos, and M. Trevisan. 2003. Alcohol-related morbidity and mortality. *Alcohol Research & Health* 27(1):39–51.

Reidpath, D. D., and P. Allotey. 2003. Infant mortality rate as an indicator of population health. *Journal of Epidemiology and Community Health* 57(5):344–346.

Reinhardt, U. E., P. S. Hussey, and G. F. Anderson. 2004. U.S. Health care spending in an international context. *Health Affairs* 23(3):10–25.

Rural Assistance Center. 2008. *Rural Health Disparities*. http://www.raconline.org/info_guides/disparities/ (accessed November 16, 2008).

SAMHSA (Substance Abuse and Mental Health Services Administration). 2006a. Figure 1. Alcohol dependence or abuse in the past year among persons aged 12 or older, by substate region: Percentages, annual averages based on 2002, 2003, and 2004 NSDUH data. *The NSDUH Report* (25).

SAMHSA. 2006b. Serious psychological distress and substance use among young adult males. *The NSDUH Report* (3):1–4.

SAMHSA. 2008. *Results from the 2007 National Survey on Drug Use and Health: National findings, NSDUH Series H–34*. Rockville, MD: HHS.

Schiff, E. R. 1997. Hepatitis C and alcohol. *Hepatology* 26(3 Suppl 1):39S–42S.

Schroeder, S. A. 2007. Shattuck lecture. We can do better—improving the health of the American people. *New England Journal of Medicine* 357(12):1221–1228.

Sherman, A., R. Greenstein, and S. Parrott. 2008. *Poverty and share of Americans without health insurance were higher in 2007—and median income for working-age households was lower—than at bottom of last recession*. Washington, DC: Center on Budget and Policy Priorities.

Shih, M., and P. A. Simon. 2008. Health-related quality of life among adults with serious psychological distress and chronic medical conditions. *Quality of Life Research* 17(4):521–528.

Simpson, G., B. Bloom, R. A. Cohen, and P. E. Parsons. 1997. Access to health care. Part 1: Children. *Vital and Health Statistics* (196):1–46.

Sing, M., J. S. Banthin, T. M. Selden, C. A. Cowan, and S. P. Keehan. 2006. Reconciling Medical Expenditure Estimates from the MEPS and NHEA, 2002. *Health Care Financing Reviews* 28(1):25–40.

Smith, G. S., C. C. Branas, and T. R. Miller. 1999. Fatal nontraffic injuries involving alcohol: A metaanalysis. *Annals of Emergency Medicine* 33(6):659–668.

Stansfeld, S. 1999. Social support and social cohesion. In *Social determinants of health*, edited by M. Marmot and R. Wilkinson. Oxford: Oxford University Press. Pp. 155–178.

Stein, M. B., B. J. Cox, T. O. Afifi, S. L. Belik, and J. Sareen. 2006. Does co-morbid depressive illness magnify the impact of chronic physical illness? A population-based perspective. *Psychological Medicine* 36(5):587–596.

Sudano, J. J., R. D. Cebul, and D. W. Baker. 2002. Access to care, regular source of care, and health care use among the intermittently uninsured. *Academy for Health Services Research and Health Policy Meeting* 19:6.

Szilagyi, P. G., and E. L. Schor. 1998. The health of children. *Health Services Research* 33(4 Pt 2):1001–1039.

The Commonwealth Fund. 2008. *Why not the best? Results from the national scorecard on U.S. Health system performance, 2008*. New York: The Commonwealth Fund.

UK Health Protection Agency. 2008. Confirmed measles cases in England and Wales—an update to end-May 2008. *Health Protection Report* 2(25).

USDA Center for Nutrition Policy and Promotion. 2002. *Report card on the quality of Americans' diets*. Alexandria, VA: USDA.

USDA Center for Nutrition Policy and Promotion. 2008. *Healthy eating index—2005*. http://www.cnpp.usda.gov/Publications/HEI/healthyeatingindex2005factsheet.pdf (accessed October 30, 2008).

van Dam, R. M., E. B. Rimm, W. C. Willett, M. J. Stampfer, and F. B. Hu. 2002. Dietary patterns and risk for type 2 diabetes mellitus in U.S. Men. *Annals of Internal Medicine* 136(3):201–209.

Wechsler, H., A. Davenport, G. Dowdall, B. Moeykens, and S. Castillo. 1994. Health and behavioral consequences of binge drinking in college. A national survey of students at 140 campuses. *JAMA* 272(21):1672–1677.

Weinick, R. M., and S. K. Drilea. 1998. Usual sources of health care and barriers to care, 1996. *Statistical Bulletin (Metropolitan Life Insurance Company)* 79(1):11–17.

Weinick, R. M., S. H. Zuvekas, and S. K. Drilea. 1997. *Access to health care—sources and barriers, 1996, MEPS research findings. No. 3*. Rockville, MD: AHRQ.

Weissman, J. S., R. Stern, S. L. Fielding, and A. M. Epstein. 1991. Delayed access to health care: Risk factors, reasons, and consequences. *Annals of Internal Medicine* 114(4):325–331.

Westat and AmericaSpeaks. 2008. *Analysis of data on historical public priorities*. Rockville, MD: Westat.

WHO (World Health Organization). 1948. *Constitution of the World Health Organization*. Geneva: WHO.

WHO. 1984. *Health promotion: A discussion document on the concept and principles*. Copenhagen: WHO.

WHO. 2008a. *10 facts on injuries and violence*. http://www.who.int/features/factfiles/injuries/en/index.html (accessed September 28, 2008).

WHO. 2008b. *Management of substance abuse: Facts and figures*. http://www.who.int/substance_abuse/facts/en/ (accessed November 16, 2008).

WHO. 2008c. *Management of substance abuse: Facts and figures. Alcohol*. http://www.who.int/substance_abuse/facts/alcohol/en/index.html (accessed November 16, 2008).

WHO. 2008d. *WHO statistical information system: Indicator definitions and metadata, 2008*. http://www.who.int/whosis/indicators/compendium/2008/en/ (accessed September 29, 2008).

Williams, J., B. Lyons, and D. Rowland. 1997. Unmet long-term care needs of elderly people in the community: A review of the literature. *Home Health Care Services Quarterly* 16(1–2):93–119.

Wold, C. 2008. *Health Indicators: A Review of Reports Currently in Use.* Pasadena, CA: Wold & Associates.

Wright, D., and N. Sathe. 2006. *State estimates of substance use from the 2003–2004 National Surveys on Drug Use and Health*. Rockville, MD: SAMHSA.

Zahran, H. S., R. Kobau, D. G. Moriarty, M. M. Zack, J. Holt, and R. Donehoo. 2005. Health-related quality of life surveillance—United States, 1993–2002. *Morbidity and Mortality Weekly Report Surveillance Summaries* 28; 54(4):1–35.

Appendix A

Agenda

Committee on State of the USA Indicators
July 21–22, 2008

Lecture Room
National Academies Building
2101 Constitution Avenue, N.W.
Washington, DC

9:00–9:15 Welcome and Overview
GEORGE ISHAM
Committee Chair

9:15–10:00 Overview of State of the USA and Presentation of Committee Charge
CHRISTOPHER HOENIG
President and Chief Executive Officer
The State of the USA
with JOEL GURIN, SUSA
and NICOLE LURIE, RAND Corp.

10:00–10:45 Discussion

10:45–11:15 Presentation: Indicators and Their Attributes
ROBERT GROVES
Survey Research Center

11:15–11:45 Discussion

11:45–1:00 LUNCH

1:00–1:30 Presentation: Existing Indicators and their Measurement
CHERYL WOLD
Wold & Associates Consulting

1:30–2:00	Discussion
2:00–2:30	A Look at Healthy People 2020 CARTER BLAKEY Office of Public Health and Science, HHS
2:30–3:00	Discussion
3:00–3:30	Community Indicators and Health Index RICHARD J. KLEIN National Center for Health Statistics
3:30	Adjourn

Appendix B

Some Current Health Indicator Reports

The report, *Health Indicators: A Review of Reports Currently in Use*, identified and discussed the 34 different indicator sets listed below. Reports selected for inclusion "had to be created from high-quality and currently available data, relevant to important health problems, and created through the use of participatory processes and involving reputable individuals and organizations" (Wold, 2008).

- America's Children
- America's Health Ranking
- Australia's Measures of Progress
- Boston Indicators Project
- Canadian Index of Well-being/Prototype
- Commission to Build a Healthier America
- Commonwealth Fund State Scorecard on Health System Performance
- Communities Count (Seattle King County, Washington)
- Community Health Status Indicators
- Dartmouth Atlas of Health Care
- Early Childhood Indicators–Project Thrive
- Environmental Public Health Indicators Project
- Five Million Lives
- Georgia Health Disparities Report
- Health Care Costs 101
- Health of Wisconsin Report Card 2007

- Healthy People 2010 Leading (max. set)
- Hospital Compare
- Jacksonville Indicators for Progress—JCCI 2007 Quality of Life Report
- Kids Count
- Los Angeles County Key Health Indicators
- National Healthcare Disparities Report
- National Healthcare Quality Report
- New York City Community Health Profiles
- New York City Health Disparities Report
- OECD Factbook 2008: Economic, Environmental and Social Statistics
- OECD Health Care Quality Index
- Older Americans 2008: Key Indicators of Well-Being
- Patient Safety in America Hospitals Study (Third Annual)
- Prevention Institute—Prototype
- The Boston Paradox: Too Much Healthcare and Not Enough Health
- Trends and Indicators in the Changing Health Care Marketplace Chartbook
- Trust for America's Health: Top 10 Priorities for Prevention
- World Health Organization

Appendix C

Domain Estimates, Reliability, and Small-Area Estimation

Many indicators can be presented at the most aggregated level (national means or rates) and for smaller subgroups. Subgroups for which measures are estimated are called "domains" in the survey world, and in this section we use this term to refer generically to any such subgroup. Domains of interest for the State of the USA, Inc. (SUSA) might include geographic areas (regions, states, counties, metropolitan areas, rural/urban comparisons) and demographic subgroups (racial/ethnic groups, age groups, socioeconomic strata). (This use of the term should not be confused with use of the term "domain" elsewhere in the report when it then refers to a conceptual domain, i.e., a set of related concepts or measures.)

Although the primary presentation of indicators on the SUSA website will be at the national level, indicators may also be presented for more refined domains for at least two reasons. First, visitors to the SUSA site will often be interested in and engaged by indicators that are specific to their local areas, or to other domains of particular interest to them such as their age group or national origin group. Viewing such domain-specific information may make the indicators more meaningful and relevant to the personal experience of the user. While SUSA cannot substitute for or incorporate the vast array of information resources available for planning by state and local government as well as commercial actors, presentation of domain indicators can enhance the value of the site to the general user. Second, measures of disparities are essentially comparisons across particular domains. Presentation of disparities was highlighted as a key objective for the health indicator set and is relevant to many of the other SUSA topic areas. The disparities section of this report details the types of comparisons that might be presented as disparities and how these and other domain comparisons might be presented as "drill-downs" linked to the main indicator displays.

Development of domain-level indicators for SUSA presents a variety of challenges based on the varying relevance of the indicators and availability of data to calculate them for various types of domains. Not every indicator can be defined meaningfully for every domain; for example, a measure of air quality might be defined for states but might not be meaningful for age groups.

The following discussion focuses on population-based measures for which domain estimates are conceptually meaningful, although not always practically obtainable with the data currently available. Two general issues affect the potential for developing domain estimates. First, the necessary variables might not be available from the same data source to both produce the indicator and define the domains of interest. For example, mortality reports used to estimate life expectancy typically include race but not income or education. A variant of this problem is that even if the data are collected in a suitable form, detailed domain-level linkages might not be publicly available due to concerns about confidentiality. For example, microdata (individual-level data) from some of the key federal health surveys, including the National Health Interview Survey (NHIS), are not generally released to the public with geographical detail below four regions, although more detailed geographical identifiers can be analyzed by researchers subject to restrictions on access.

Second, as data are broken down to smaller domains, the amount of data available for each domain also becomes smaller, reducing the statistical precision of estimates for those domains. With a simple random sampling survey design, the standard error (SE) of estimates, a measure of the typical size of errors due to random variation, is inversely proportional to the square root of the sample (or population size). Thus for a domain constituting a fourth of the population, the SE would be twice as large as for the entire population. With the more complicated designs typical of national surveys, the relationship of domain size to SE might be more complex; for example, the NHIS design collects no data at all from many counties.

The more or less gradual decline in precision for smaller domains suggests that some standards are required for precision and that domain measures should not be reported if they do not meet those standards. Such a procedure is followed in some standard tabular reports, where low reliability (or confidentiality concerns) might lead to suppression of measures for some small domains; criteria for suppression are set by the various agencies producing the reports. The criterion for suppression might be a large SE relative to some absolute standard of an important difference. Alternatively, the criterion might be based on a statistical measure of reliability, comparing the SE of domain measures to the underlying true variation among domains. Zaslavsky (2001) argues, for example, for interunit reliability (IUR) as a measure of reliability of indicators used for comparisons among health care providers, with IUR > .7 as a minimal standard for comparison among domains and IUR > .9 desirable to make most comparisons statistically significant when there is a real difference.

It might be argued that sampling variation is not an issue for indicators based on essentially complete data, such as vital statistics or the census. This argument would be valid if the purpose of SUSA were simply to report what has happened in the past. However, even indicators based on population information (complete, rather than sampled) about the relevant events might lack reliability for making broader inferences about the domains of interest. Thus, for example, we might be able to state with a high level of certainty that a small town had three deaths in the past year, but this would not be particularly useful for deciding whether some meaningful and persistent pattern of excess or low mortality held in that town (Elliott et al., 2006).

Schematically, indicator estimation for domains could fall into one of the several scenarios.

1. Adequate data might be available for domain estimates from the preferred data source, that is, the same source used for the national indicator. In this case, the domain indicators would be obtained in the same manner as the national indicator. (Such estimators based only on data from within the domain are called “direct” estimators.) This would be the case for most domains, for example, for indicators based on the census or vital statistics, but as noted above even these might not be reliable for very small domains.
2. Adequate data are available for domain estimates from a usable data source other than the preferred data source. An example might be “percentage with a usual source of care.” The recommended data source for that national indicator is the Medical Expenditure Panel Survey-Household Component (MEPS-HC), a high-quality survey conducted using nationally uniform methods by a single agency. The MEPS-HC sample consists of 15,000 households per year, or an average of about 300 per state. Furthermore the sample is based on the NHIS, which uses a clustered sample based on counties; thus a given state might be represented by only one or a few counties. Hence the representation of most states does not support an adequately precise measure at the state level, and indeed

MEPS data are not released at the state level. Another survey, the Behavioral Risk Factor Surveillance System (BRFSS), asks a similar question and uses a much larger sample size (more than 300,000 respondents per year) with adequate representation of every state and some large counties. However the BRFSS data collection is limited to households with land-line telephones, has limited follow-up of non-respondents, is conducted separately by each state, and uses item wording that is different from the MEPS, all of which make it a less valid population measure and not entirely comparable to the MEPS estimates. Therefore, one would want to use the MEPS for the national measure and for demographic (e.g., racial/ethnic subgroup) domains, and to use the BRFSS for geographic domains such as states or substate areas. Another approach that might work for some other measures with small sample sizes would be to combine data across years, obtaining a measure that is a less valid estimate in any given year but more precise for domains than a single-year measure.

A general disadvantage of these approaches is that the domain indicator data would not aggregate up to the national indicator because they are based on a different methodology. Hence it would be essential to include information on the page with domain estimates explaining to the user that the information is presented only for comparative purposes and is not comparable to the main national indicator. To allow valid comparisons of domain indicators to national indicators, the national mean for the alternative data source should also be presented with the domain indicators. (Another approach that might avoid such inconsistencies is described below.)

3. There are no data of acceptable precision available for the domains in question, due to small sample sizes and/or a sample design that does not cover all areas. In this case, indirect estimators (using data from outside the domain) might be used, as described below.

Statistical "small-area estimation" approaches can sometimes be used to develop usable domain estimates in scenarios 2 and 3 above. "Small-area estimation" refers to methods for obtaining usable estimates for domains for which sample sizes are inadequate to produce adequately precise estimates using only data from within the domain. The essence of these methods is to use data from outside the domain (often, national data) to estimate relationships of the measure of interest to other variables, and then use those relationships to improve estimation of the measure. Several statistical approaches to small-area estimation are described briefly; a comprehensive review appears in Ghosh and Rao (1994).

- *Synthetic estimation*: First estimate rates or means for demographic groups, such as white males aged 30–34, and then combine these rates weighted by the proportions the groups constitute of the population in the domain to obtain a domain estimate. This method captures variations due to the differing composition of the domains.
- *Regression estimation*: Regress area measures on other variables (covariates) measured for each area with greater precision; then calculate and report regression predictions for each domain. Note that regression estimation can be used to calibrate a measure with large sample size but lesser validity (like BRFSS, in the preceding example) to match estimates from another system with less sample but better validity (like the MEPS); see Xie et al. (2007).
- *Composite estimates*: Calculate model-based predictions for each domain, using synthetic or regression estimation or some other variant. Then combine the model and direct estimate to obtain a composite estimate that is more accurate than either of its components alone.
- *Empirical or hierarchical Bayes* estimators use a multilevel model to derive the best weighting to give the model and direct estimates when they are combined in a composite. In essence, each is weighted proportionally to its precision. If the direct estimator is more precise relative to the predictive accuracy of the model, the direct estimate receives more weight; conversely if the direct estimator is less precise (due to small sample size in the domain) then the model-based estimator receives more weight. Similar models can also be used to improve estimates by combining information over time or by jointly estimating several related variables, such as income levels in several age groups.

When domain estimates are drawn from a reliable but inconsistent source (as in the example of the MEPS and the BRFSS described above), the domain estimates can be made consistent with the national estimates from a different source ("calibrated" to national estimates) by either simple or more sophisticated statistical methods. Simple calibration methods include ratio adjustments or weighting to make a total from one survey consistent with the other. As mentioned above, regression estimation can also be used for this purpose. For more sophisticated adjustments, measures from the detailed but less valid survey (e.g., the BRFSS) can be regarded as domain-level covariates for small-area estimation for the national survey (e.g., the MEPS).

The Small Area Income and Poverty Estimates (SAIPE) program of the Census Bureau releases small-area estimates of income and poverty by age group for states, counties and school districts (http://www.census.gov/hhes/www/saipe/, REFS to CNSTAT reports). These are calculated using a multivariate hierarchical Bayes model. A relatively new Small Area Health Insurance Estimates (SAHIE) program releases similar estimates for states and counties (http://www.census.gov/hhes/www/sahie/). Estimates from these programs are likely to become increasingly accurate as data from the American Community Survey (ACS) become available, providing additional small-area detail. The Substance Abuse and Mental Health Services Administration (SAMHSA) releases small-area estimates for states and sub-state areas of variables related to substance use, treatment and mental health, based on data from the National Survey on Drug Use and Health (NSDUH) (SAMHSA, 2008). Numerous research studies have been performed to develop small-area estimates of health-related indicators, of which we cite only a few examples (Nandram and Choi, 2005; Schenker and Raghunathan, 2007; Xie et al., 2007). However, it is not evident that any of these have been adopted by any agency to be produced as an ongoing series. Thus although small-area estimation has the potential to fill important gaps in availability of domain estimates, the actual availability of such estimates is limited. The SUSA project should monitor the future availability of such estimates and encourage their development on an ongoing basis by agencies.

REFERENCES

Elliott, M., A. Zaslavsky, and P. Cleary. 2006. Are finite population corrections appropriate when profiling institutions? *Health Services and Outcomes Research Methodology* 6(3):153–156.

Ghosh, M., and J. N. K. Rao. 1994. Small area estimation: An appraisal. *Statistical Science* 9(1):55–76.

Nandram, B., and J. W. Choi. 2005. Hierarchical bayesian nonignorable nonresponse regression models for small areas: An application to the NHANES data. *Survey Methodology* 31(1):73–84.

SAMHSA (Substance Abuse and Mental Health Services Administration). 2008. *Substate estimates from the 2004–2006 national surveys on drug use and health*. Rockville, MD: SAMHSA.

Schenker, N., and T. E. Raghunathan. 2007. Combining information from multiple surveys to enhance estimation of measures of health. *Statistics in Medicine* 26(8):1802–1811.

Xie, D., T. E. Raghunathan, and J. M. Lepkowski. 2007. Estimation of the proportion of overweight individuals in small areas—a robust extension of the fay-herriot model. *Statistics in Medicine* 26(13):2699–2715.

Zaslavsky, A. M. 2001. Statistical issues in reporting quality data: Small samples and casemix variation. *International Journal for Quality in Health Care* 13(6):481–488.

Appendix D

The Commonwealth Fund Algorithm and Coding for Preventive Services

The following all-preventive care indicator was developed by Cathy Schoen, Senior Vice President of The Commonwealth Fund on behalf of the Fund's Commission on a High Performance Health System for use in the Commission's national scorecard on U.S. system performance. It was first published in the 2006 report, *Why Not the Best?: Results From National Scorecard on U.S. Health System Performance*, The Commonwealth Fund, September 2006 and updated in the 2008 National Scorecard published in August 2008. Supported by a grant from The Commonwealth Fund, Bisundev Mahato of Columbia University Mailman School of Public Health provided the programming algorithm for the Medical Expenditure Panel Survey (MEPS) and conducted the MEPS data analyses. The Commonwealth Fund provided permission to include the analysis in this report.

Using responses to specific questions about preventive services in the MEPS survey, the algorithm to calculate the indicator on receipt of screening services and flu shots uses information on the following specific services and time frames:

Blood pressure check in 2 years
Cholesterol check in 5 years
Fecal occut blood stool test in 2 years
Colonoscopy or sigmoidoscopy EVER
Flu shot in past year
Pap smear in 3 years
Mammogram in 2 years

Since guidelines for receipt of screening and preventive services and both age- and gender-specific, respondents are divided into groups for which specific sets of services are indicated. These groups are:

Men, ages 18–49 ==> BP & CHOL
Men, ages 50–64 ==> BP & CHOL & FOBT/COLONSIG
Men, ages 65+ ==> BP & CHOL & FOBT/COLONSIG & FLU

Women, ages 18–39 ==> BP & CHOL & PAP
Women, ages 40–49 ==> BP & CHOL & PAP & MAM
Women, ages 50–64 ==> BP & CHOL & PAP & MAM & FOBT/COLONSIG
Women, ages 65+ ==> BP & CHOL & PAP & MAM & FOBT/COLONSIG & FLU

To calculate the indicator, a provisional value of “yes” is set for each individual in each group, and then reset to “no” if a specific service is not reported by that individual in the appropriate time frame. The indicator is then the percentage of respondents (in each group or in all groups combined) for whom the receipt of services variable is “yes” after going through all services. Even though the number of recommended services varies by age and gender, the percent “yes” is interpretable in the same way for each group and combinable across groups to yield an overall percentage for all adults.

The detailed coding for this algorithm is presented below.

```
*1. initial preventive care indicator variables
capture label drop yn
label define yn 0”No” 1”Yes” 9”DK, Refused, Not Ascertained”

gen choles5yr=cholck3<=4
replace choles5yr=9 if cholck3<=-7
replace choles5yr=. if cholck3==-1
label var choles5yr “cholesterol screen in past 5 yrs”
label values choles5yr yn

gen bp2yr=bpchek3<=2
replace bp2yr=9 if bpchek3<=-7
replace bp2yr=. if bpchek3==-1
label var bp2yr “blood pressure checked in past 2 yrs”
label values bp2yr yn
```

```
*cholesterol AND blood pressure in recommended intervals
gen choles5yrbp2yr=1
replace choles5yrbp2yr=0 if (choles5yr==0 | bp2yr==0 | (choles5yr==9
& bp2yr==9))&agex>=18
replace choles5yrbp2yr=. if choles5yr==. & bp2yr==.
label values choles5yrbp2yr yn

gen mam2yr= mamogr3<=2
replace mam2yr=9 if mamogr3<=-7
replace mam2yr=. if mamogr3==-1
label var mam2yr "mammogram in past 2 yrs"
label values mam2yr yn

gen pap3yr=papsmr3<=3
replace pap3yr=9 if papsmr3<=-7
replace pap3yr=. if papsmr3==-1
label var pap3yr "PAP in past 3 yrs"
label values pap3yr yn

gen inf1yr=flusht3<=1
replace inf1yr=9 if flusht3<=-7
replace inf1yr=. if flusht3==-1
label var inf1yr "flu shot in past yr"
label values inf1yr yn

gen bldstool2yr=whenst3==1|whenst3==2
replace bldstool2yr=9 if whenst3<=-7|stool3<=-7
replace bldstool2yr=. if stool3==-1
label var bldstool2yr "blood stool test in past 2 yrs"
label values bldstool2yr yn

gen sigcolonever=bowel3==1
replace sigcolonever=9 if bowel3<-7
replace sigcolonever=. if bowel3==-1
label var sigcolonever "EVER had a sigmoidscopy or colonoscopy"
label values sigcolonever yn

*Colon1: FOBT in past 2 years OR ever sig/colonoscopy
gen colon1=0
replace colon1=1 if bldstool2yr==1 | sigcolonever==1 | agex<50
replace colon1=. if bldstool2yr==. & sigcolonever==.
label values colon1 yn
```

```
***********************************
*Composite using all of the above using colon1
*Each adult will be coded a yes=1 if received all age and health
condition appropriate screening included in MEPS. Or no=0 if missing
any of the recommended care

* Men:
*18–49:  blood test and cholesterol
gen compositeall1=1
replace compositeall1=0 if choles5yrbp2y==0 & agex>=18 & agex<=49
& sex==1
replace compositeall1=. if choles5yrbp2y==. & agex>=18 & agex<=49 &
sex==1
*50 –64: blood test, cholesterol, colon screens (FOBT or scope)
replace compositeall1=0 if (choles5yrbp2y==0 |colon1==0) & agex>=50
& agex<=64  & sex==1
replace compositeall1=. if (choles5yrbp2y==. &colon1==.) & agex>=50 &
agex<=64  & sex==1
*65 and older: blood test, cholesterol, colon screens (FOBT or scope), flu
vaccine past year and pneumococcal immunization ever
replace compositeall1=0 if (choles5yrbp2y==0 |colon1==0 | inf1yr==0)
& agex>=65  & sex==1
replace compositeall1=. if (choles5yrbp2y==. &colon1==. & inf1yr==.) &
agex>=65  & sex==1

*Women:
*18–39:  blood test, cholesterol, PAP
replace compositeall1=0 if (choles5yrbp2y==0 | pap3yr==0) & agex>=18
& agex<=39  & sex==2
replace compositeall1=. if (choles5yrbp2y==. & pap3yr==.) & agex>=18
& agex<=39  & sex==2
*40–49:  blood test, cholesterol, PAP + mammogram
replace compositeall1=0 if (choles5yrbp2y==0 | pap3yr==0 |
mam2yr==0 ) & agex>=40 & agex<=49  & sex==2
replace compositeall1=. if (choles5yrbp2y==.&pap3yr==.&mam2yr==.)
&agex>=40&agex<=49&sex==2
*50–64:  blood test, cholesterol, PAP + mammogram + colon screens
(FOBT or scope)
replace compositeall1=0 if (choles5yrbp2y==0 | pap3yr==0 |
mam2yr==0 | colon1==0) & agex>=50 & agex<=64  & sex==2
replace compositeall1=. if (choles5yrbp2y==.&pap3yr==.&mam2yr==.&
colon1==.)&agex>=50&agex<=64&sex==2
```

```
*65 and older: blood test, cholesterol, PAP, mammogram + colon screens
(FOBT or scope) + flu + pneumococcal immunization ever
replace compositeall1=0 if (choles5yrbp2y==0 | pap3yr==0 |
mam2yr==0 | colon1==0 | inf1yr==0) & agex>=65 & sex==2
replace compositeall1=. if (choles5yrbp2y==.&pap3yr==.&mam2yr==.&
colon1==.&inf1yr==.)&agex>=65&sex==2
label var compositeall1 “composite all using colon1”
label values compositeall1 yn

************************************
*weighting command [fw=wtdper]
```