vaccination rates among children) can be used to identify strategies for addressing remaining disparities.

CDC's role in addressing disparities will continue to include surveillance, analysis, and reporting through periodic CHDIRs. In addition, CDC has a key role in encouraging use of evidence-based strategies, supporting public health partners, and convening expert and public stakeholders to secure their commitment to take action.

The primary target audiences for CHDIR 2011 include practitioners in public health, academia and clinical medicine, the media, general public, policymakers, program managers, and researchers. CHDIR 2011 complements but does not duplicate the contents of the annual National Healthcare Disparities Report (*12*) and the periodic reports related to *Healthy People 2010* (*17*).

CHDIR 2011 contains a limited collection of topics, each exploring selected indicators of critical U.S. health problems. Topics included in CHDIR 2011 were selected on the basis of one or more of the following criteria: 1) leading causes of premature death among segments of the U.S. population as defined by sex, racial/ethnicity, income or education, geography, and disability status; 2) social, demographic, and other disparities in health outcomes; 3) health outcomes for which effective and feasible interventions exist; and 4) availability of high-quality national-level data. For each of the topics and indicators, subject-matter experts used the most recent national data available to describe disparity measures (absolute or relative) by sex, race/ethnicity, family income (percentage of federal poverty level), educational attainment, disability status, and sexual orientation. Because of limits on data availability and optimal size of the report, certain topics of potential interest in the health disparities literature have been excluded. For example, disparities by country of birth and primary language spoken are not included in this report. Residential segregation, a social determinant of health, will be included in a future report when census tract level data from the 2010 U.S. Census become available in 2011. In each topic-specific analytic essay, the contributors describe disparities in social and health determinants among population groups. Each narrative and its tabular and graphic elements reveal the findings, their meaning, and implications for action if known.

The National Partnership for Action (NPA) to end health disparities is a national plan for eliminating health disparities affecting U.S. racial/ethnic minorities sponsored by the U.S. Department of Health and Human Services (DHHS) Office of Minority Health. One of NPA's five objectives is to ensure the availability of health data for all racial/ethnic minority populations. CHDIR 2011 will contribute to the achievement of that objective.

Measures of Health Inequality

Disparities are most often presented as a series of pair-wise comparisons: strata of a particular variable compared with a referent group. An index of disparity summarizes pair-wise comparisons into a single measure of disparity among a population (*21*). Health inequality — measured by using methods that originated in economics — provides summary measures that capture inequality in the overall distribution of health among persons or groups within a population.

A measure of health inequality can summarize in one number, instead of multiple pair-wise comparisons, the difference between individual persons or segments of a population with regard to a health outcome or related attribute by using all information available about the whole population instead of only the extremes of the distribution (*22*). Consistent estimates of health inequality at national, state, tribal, or local levels enable useful comparisons across indicators of health status and across time for each indicator; reveal targets for reducing inequality at multiple levels of geography; and compare inequality in the need for services with availability of services for different population segments. Thus, health indicators with lower inequality among the overall U.S. population but with higher inequality within certain groups require further exploration by focusing specifically on the determinants and potential remedies for the higher inequalities within population groups. If the data were available, the indicators in this report could be compared and ranked in terms of the degree of inequality among the U.S. population overall and within specific segments. To illustrate what might be possible with adequate data in future reports, three indicators of inequality are presented and compared by using the Gini index of inequality (*23*): 1) inequalities in income; 2) years of potential life lost (YPLL) before age 75 years; and 3) the Health and Activities Limitation Index (HALex), a measure of health-related quality-of-life (HRQL).

The Gini index, the most commonly used measure of income inequality, measures the extent to which the income distribution among a population deviates from theoretical income distribution in which each proportion of the population earns the same proportion of total income. The index varies from 0 to 1, with higher values indicating greater inequality (i.e., 0 indicates complete equality, and 1 indicates perfect inequality). The Gini index has been adapted to measure health inequality across populations by providing estimates that capture the distribution of health, or health risk, among the entire population or within specific groups. Researchers and policymakers recognize the importance of both individual- and group-level approaches in measuring health inequality because they capture different dimensions of health inequality that can complement one another to strengthen the overall assessment of population health (*13,24,25*).

Individual-Level Measures of Inequality

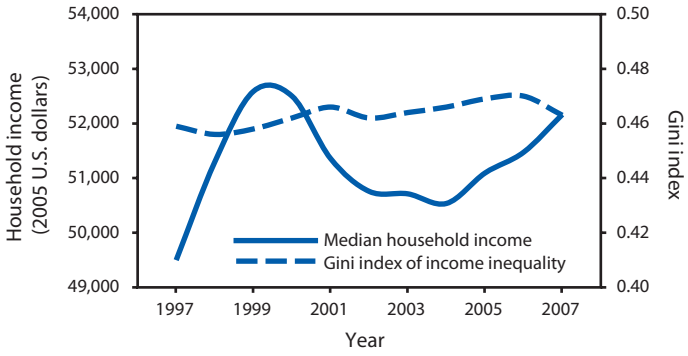
Income inequality. Income inequality in the United States (Gini index of 0.46 in 2007) (Table, Figure 1) is the highest among advanced industrialized economies (e.g., the combined Gini index for countries in the European Union and Russia is 0.31, ranging from the lowest score of 0.23 in Sweden to the highest for Russia at 0.41) (*26,27*), and demonstrates an increasing trend during 1997–2007 (Table, Figure 1). During this period, the U.S. median household income fluctuated but experienced an overall increasing trend. A Gini index of 0.46 in 2007 is half of the average relative

TABLE. Inequality in income, premature mortality, and health-related quality of life — United States, 1997–2007

Inequality measure	Year										
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Median household income	$49,497	$51,295	$52,587	$52,500	$51,356	$50,756	$50,711	$50,535	$51,093	$51,473	$52,163
Household income inequality (Gini index)	0.4590	0.4560	0.4580	0.4620	0.4660	0.4620	0.4640	0.4660	0.4690	0.4700	0.4630
Between-state income inequality (Gini index)	0.0628	0.0636	0.0612	0.0646	0.0658	0.0671	0.0624	0.0701	0.0677	0.0713	0.0749
Premature mortality (years of potential life lost before age 75 yrs/100,000 population)	7108.3	6960.6	6920.0	6899.5	6940.6	6965.2	6970.7	6841.5	6912.9	6882.0	6799.5
Between-state inequality in premature mortality (Gini index)	0.0762	0.0785	0.0820	0.0850	0.0819	0.0861	0.0868	0.0926	0.0939	0.0963	0.0956
Mean Health and Activities Limitation Index (HALex), ages 18–65 yrs	0.8766	0.8762	0.8779	0.8783	0.8747	0.8722	0.8711	0.8712	0.8708	0.8684	0.8662
Inequality in HALex (Gini index), ages 18–65 yrs	0.0928	0.0872	0.0848	0.0840	0.0871	0.0884	0.0888	0.0878	0.0886	0.0904	0.0862

* DeNavas-Walt, Carmen, Bernadette D. Proctor, and Jessica C. Smith, U.S. Census Bureau, Current Population Reports, P60-235, Income, Poverty, and Health Insurance Coverage in the United States: 2007, U.S. Government Printing Office, Washington, DC, 2008.
† Based on the U.S. Census Bureau, Current Population Survey, 1997–2007, annual social and economic supplements.
§ Years of potential life lost estimates were extracted from CDC's Web-based Injury Statistics Query and Reporting System (WISQARS). Available at http://www.cdc.gov/injury/wisqars/index.html. Data source: CDC/National Center for Injury Prevention and Control (NCIPC). WISQARS years of potential life lost (YPLL) reports, 1999–2007. Atlanta, GA: US Department of Health and Human Services, CDC, NCIPC. Available at http://webappa.cdc.gov/sasweb/ncipc/ypll10.html. Population estimates were extracted from CDC Wonder. Available at http://wonder.cdc.gov/.
¶ Mean of and Inequality in Health and Activities Limitation Index were estimated by using data retrieved from the National Health Interview Surveys, 1997–2007.

FIGURE 1. Median household income* and income inequality† — United States, 1997–2007



Source: DeNavas-Walt, Carmen, Bernadette D. Proctor, and Jessica C. Smith, U.S. Census Bureau, Current Population Reports, P60-235, Income, Poverty, and Health Insurance Coverage in the United States: 2007, U.S. Government Printing Office, Washington, DC, 2008.
* 2005 U.S. dollars.
† Based on Gini index.

difference (0.92) in average income between any two U.S. households chosen at random. The relative difference in average income is the absolute difference in average income ($64,590) between any two households divided by the average income for all households ($70,207) (*28*).

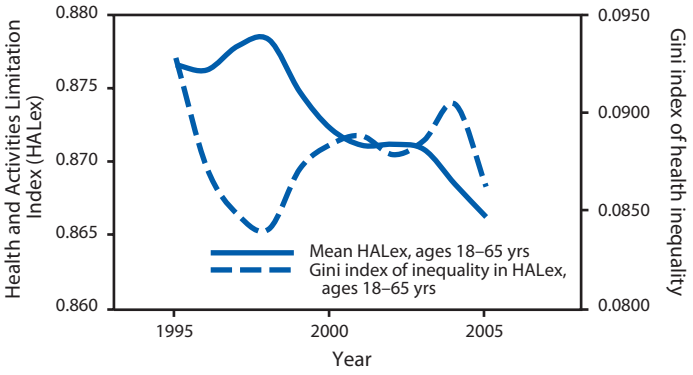
HALex. HALex provides one individual-level measure of HRQL that can be used to monitor health status as well as examine inequalities in morbidity across time and groups. HALex provides a numerical measure that combines information on self-rated health and activity limitation reported in nationally representative surveys (*29,30*). HALex scores can theoretically range from 1.00 for persons who have no activity limitation and are in excellent health to 0.10 for persons who are limited in activities of daily living (ADL) and are in poor health. HALex scores are based on assumptions and are described elsewhere (*29,30*). For example, a person in excellent health with activities of daily living disabilities is considered as healthy, with an assigned HALex score of 0.47, as a person in poor health with no disabilities.

The average HALex and inequality for HALex among U.S. adults for 1997–2007 is estimated and presented (Figure 2). Although U.S. residents are living longer, the average HRQL among adults (ages 18–65 years), measured by using HALex, demonstrated a declining trend from 0.8766 in 1997 to 0.8662 in 2007. During the same period, health inequality among individual persons, as measured by the Gini index for HALex, fluctuated, varying from 0.084 to 0.093, and experienced an overall declining trend from 0.093 in 1997 to 0.087 in 2007.

Group-Level Measures of Inequality

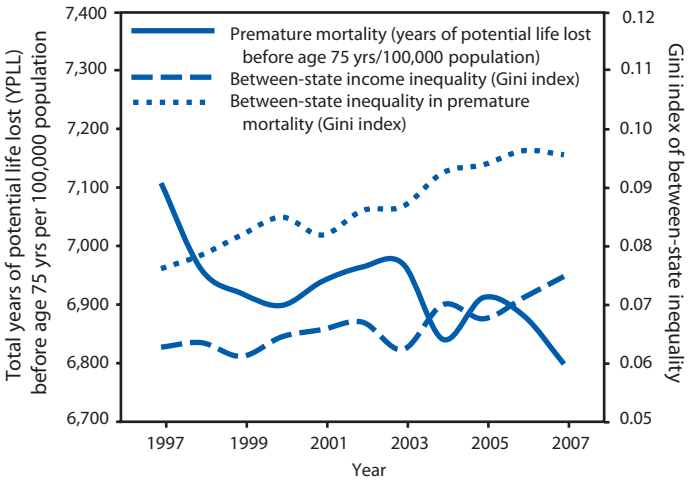
Income inequality. The Gini index measuring inequality between states in average household income increased slightly from 0.063 in 1997 to 0.075 in 2007 (Table, Figure 2). Inequality between states is lower than inequality between individual persons across the nation as a whole because the former is based on average values within states; averaging attenuates some of the variability between individual persons. Nonetheless, this trend indicates that income inequality between states is increasing with time.

FIGURE 2. Average Health and Activities Limitation (HALex) and inequality in HALex among adults aged 18–65 years* — United States, 1997–2007



Source: Gini index and mean of Health and Activities Limitation Index were estimated by using data retrieved from the National Health Interview Surveys, 1997–2007. Available at http://www.cdc.gov/nchs/nhis.htm.
* Based on Gini index.

FIGURE 3. Premature mortality rate* and inequality in income and premature mortality rate between states† — United States, 1997–2007



Source: Gini Index and mean of years of potential life lost (YPLL) were authors' calculation based on YPLL data extracted from CDC's Web-based Injury Statistics Query and Reporting System (WISQARS) (Available at http://www.cdc.gov/injury/wisqars/index.html.) and population estimates extracted from CDC WONDER (Available at http://wonder.cdc.gov). Between-state inequalities in household income were authors' calculation based on data from the U.S. Census Bureau, Current Population Survey, 1997–2007, annual social and economic supplements.
* Years of potential life lost (YPLL) before age 75 years per 100,000 population.
† Based on Gini index.

Premature mortality. YPLL before age 75 years is a common measure of premature mortality. Although the rate of premature mortality in the United States has been declining in recent years, considerable variation in rates still exists across states, with the inequality in YPLL between states, as measured by the Gini index, increasing from 0.076 in 1997 to 0.096 in 2007 (Table, Figure 3). A Gini index of inequality of YPLL of 0.096 in 2007 is related directly to the average difference in YPLL/100,000 population between any two states chosen at random (average difference = 0.19 YPLL/100,000 population).

Healthy days. The number of healthy days is an HRQL measure routinely reported by CDC and considered particularly useful in identifying health disparities among population groups (*31*). Healthy days are measured as the overall number of days during the previous 30 days during which a person reported good (or better) physical and mental health. The average number of healthy days and the inequality in healthy days among adults (ages ≥18 years) by states is estimated by using data from the 2007 Behavioral Risk Factor Surveillance System. Certain states (e.g., Utah, Connecticut, and North Dakota) that have the highest mean healthy days have the lowest health inequality, and vice versa (Figure 4).

This examination of inequalities indicates that inequalities in income, YPLL, HALex, and healthy days measured across individual persons and among states were present in 2007. The magnitude of inequality or trends in inequality during 1997–2007 varies on the basis of measures used and depending on whether individual- or group-level data are analyzed. The healthy days analysis indicates that states that have lower average health also have higher health inequality. At each level (low, medium, high) of the U.S. income distribution, higher health inequality is associated with lower average number of healthy days ($p<0.001$, t-test of slope coefficient of linear regression line) (Figure 5). Using YPLL, HALex, and healthy days to illustrate the potential value of health inequality measures in this report does not resolve controversies surrounding the choice of appropriate measures of premature mortality and HRQL for monitoring population health status in the United States (*17,32*). Research into the attributes and psychometric properties of alternative measures of premature mortality and HRQL is ongoing. Emerging consensus on the best available measures for monitoring health disparities and inequalities in premature mortality and HRQL should be reflected in future editions of this report.

Gaps in the National Data

Efforts to monitor and report periodically on health disparities are confronted by data gaps in two critical disparity domains defined in the *Healthy People* series of national planning objectives (*1,13*): 1) disability status and 2) sexual orientation and identity. In CHDIR 2011, data gaps in disability status are evident. Only eight of the 22 topics include health disparities by disability status. Federal interagency working groups are discussing strategies for expanding the collection of data by disability status. Data gaps in sexual orientation are even more severe in that only one topic (human immunodeficiency virus diagnosis) contains information on disparities in a health outcome by a sexual behavior (i.e., men who have sex with men) that is related but not identical to sexual orientation, identity, or attraction. Similar discussions are under way regarding strategies to expand the collection of data by dimensions of sexual orientation (identity or attraction) and disability status.