



Child Mortality in the United States, 1935-2007:

LARGE RACIAL AND SOCIOECONOMIC DISPARITIES HAVE PERSISTED OVER TIME

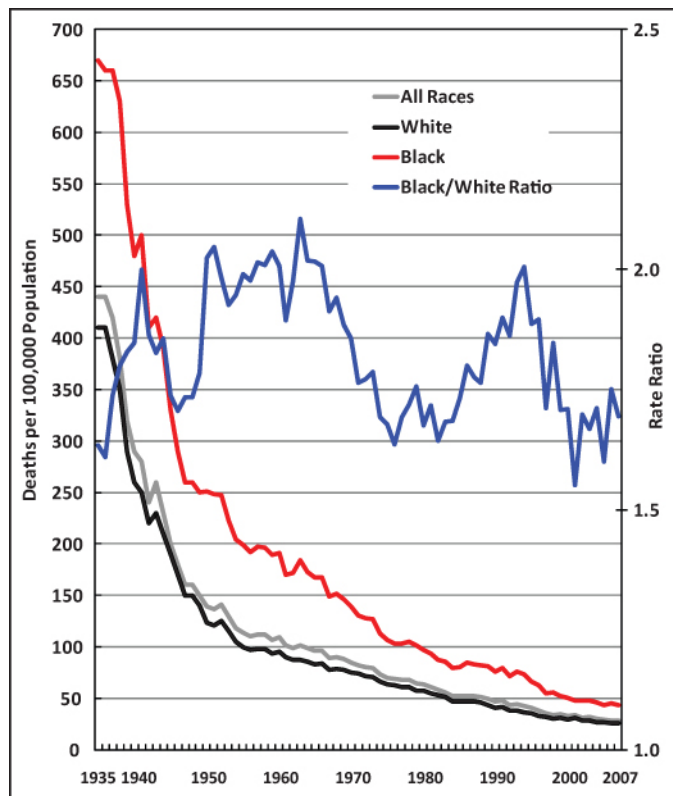


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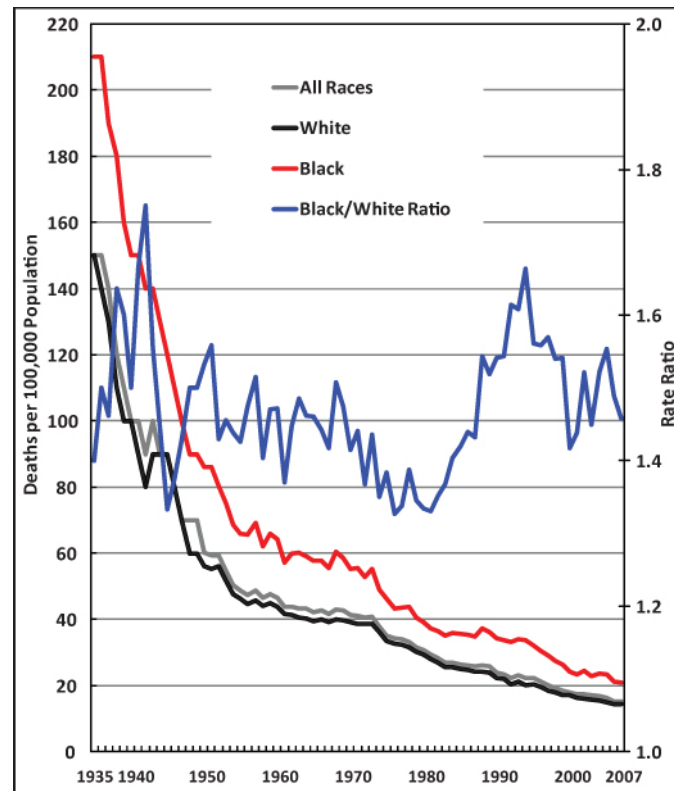
Figure 1: Death Rates for Children Aged 1-4 Years by Race, United States, 1935-2007



Child mortality in the United States has declined dramatically over the past century (1-5). The mortality rate for children aged 1-4 years declined from 1,418.8 deaths per 100,000 population in 1907 to 28.6 in 2007 (3, 4). The mortality rate for children aged 5-14 years declined from 307.5 in 1907 to 15.3 in 2007 (3, 4). In 1900-1902, 90.2% of U.S. children aged 1 year survived to age 15, compared to 99.7% of children in 2007 (2, 4). Despite such impressive reductions in overall child mortality, large racial and ethnic disparities have continued to exist in the United States, and the recent evidence points to a widening of socioeconomic inequalities in child mortality (2, 3).

In this brief report, we analyze long-term trends in mortality among children aged 1-4 and 5-14 years according to race/ethnicity, sex, cause of death, family poverty level, and state of residence by using both historical and the latest national vital statistics data (3-5). As shown below, the impressive decline in the overall child mortality rates over the long term has been due to large reductions in mortality from unintentional injuries, pneumonia and influenza, cancer, and birth defects.

Figure 2: Death Rates for Children Aged 5-14 Years by Race, United States, 1935-2007



Trends in Mortality among Children Aged 1-4 and 5-14 Years by Race and Sex

Although mortality trend data extend farther back in time for the entire United States and the birth and death registration areas, we chose 1935 as the start of the time trend analysis since it coincided with the inception of Title V of the Social Security Act, a national public health legislation aimed at promoting and improving the health and welfare services for all mothers and children. The death rate for children aged 1-4 years showed a consistently downward trend between 1935 and 2007, decreasing at a rapid rate of 3.3% per year (Figure 1). Although the rate of decline in mortality among both white and black children aged 1-4 was similar during 1935-2007, black children had 1.6 to 2.0 times higher mortality than white children throughout this period (Figure 1). In 2007, the death rate for black children aged 1-4 was 43.7 deaths per 100,000 population, 69% higher than the rate for white children (25.8). The detailed racial/ethnic data in 2007 indicate the lowest death rate among Asian/Pacific Islander children aged 1-4 years (20.9), followed by Hispanics (25.2), non-Hispanic whites (25.5), American Indians/Alaska Natives (39.2), and blacks (43.7). As for the trend in sex differentials during the past 6 decades, the death rate for male children aged 1-4 has been approximately 15-30% higher than the rate for female children.

Figure 3: Leading Causes of Death among Children Aged 1-4, United States, 2007

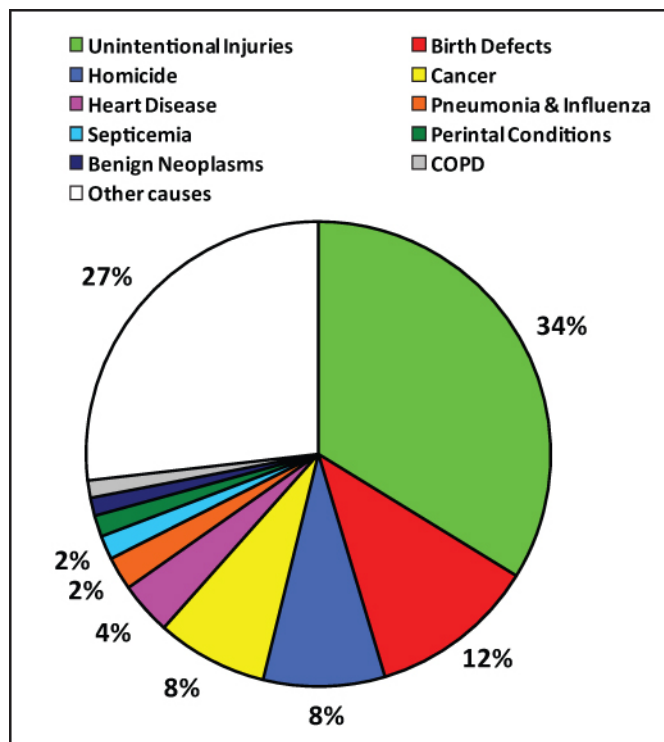


Figure 4: Leading Causes of Death among Children Aged 1-4, United States, 1970

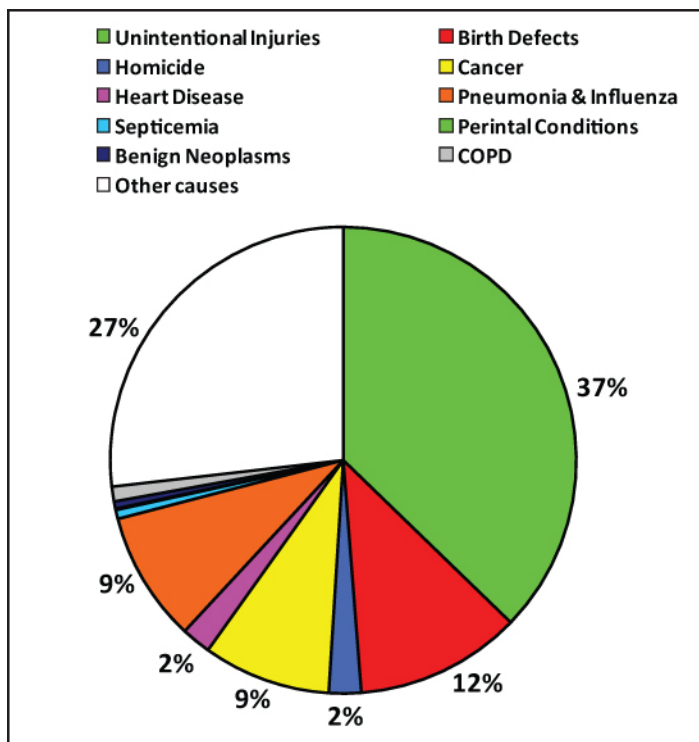


Figure 5: Leading Causes of Death among Children Aged 5-14, United States, 2007

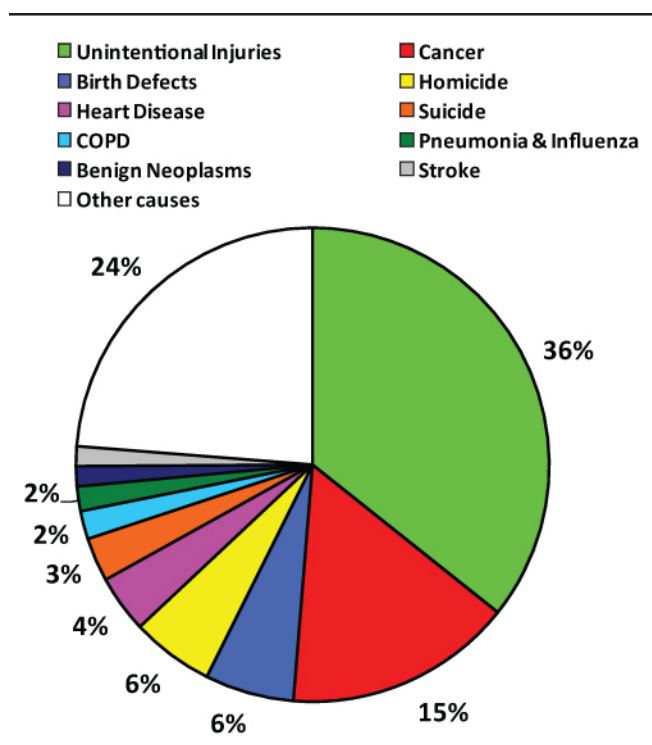


Figure 6: Leading Causes of Death among Children Aged 5-14, United States, 1970

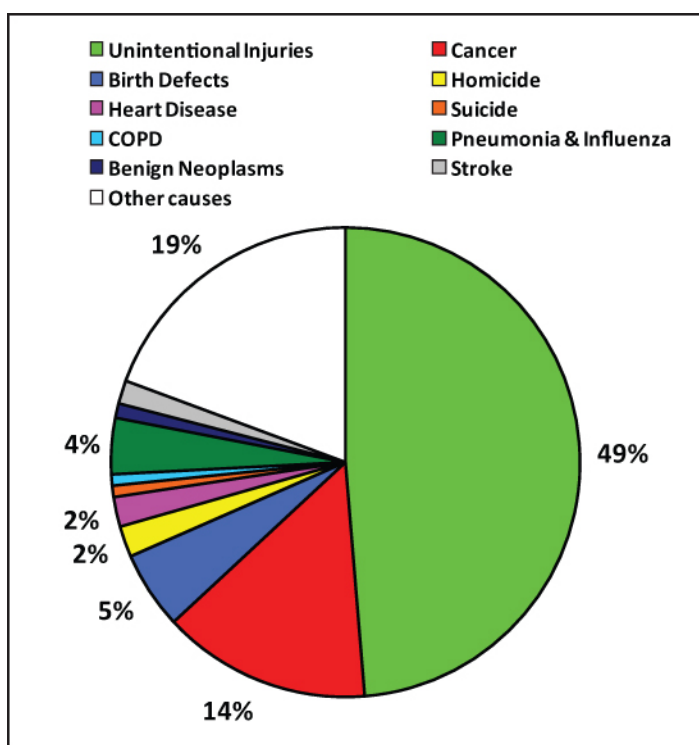


Figure 7: All-Cause Mortality Among Children Aged 1-14 Years by County-Level Family Poverty Rate, United States, 1969-2007

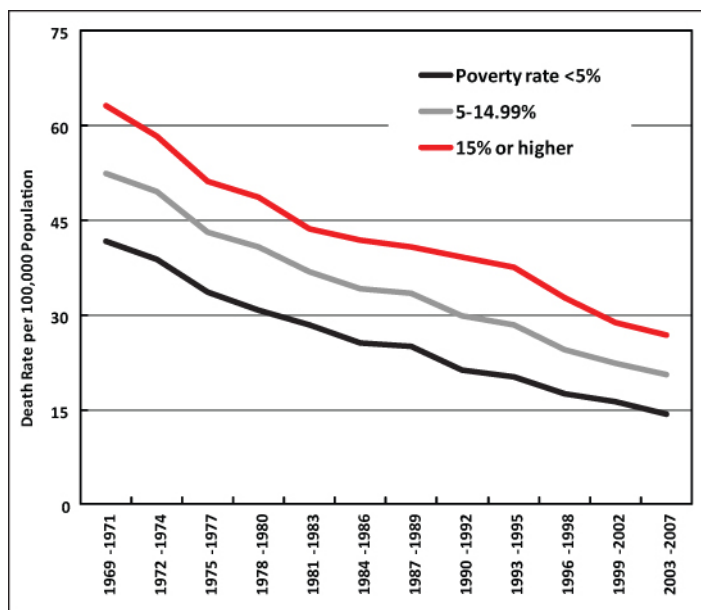
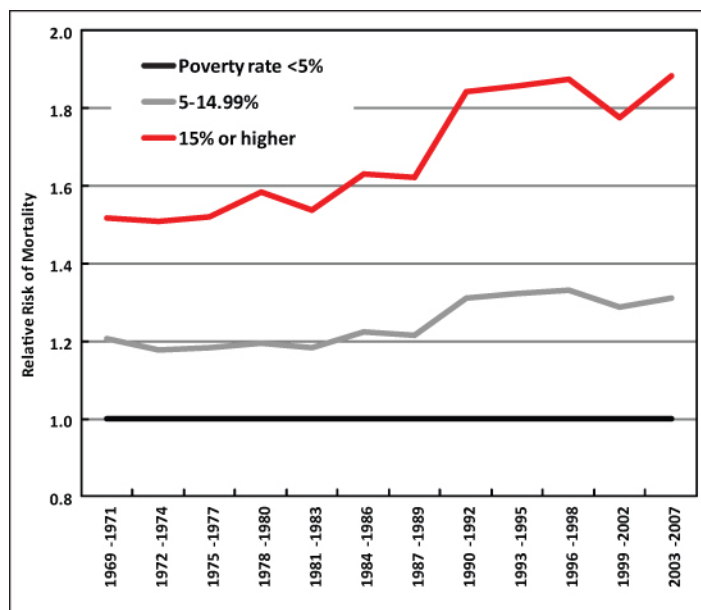


Figure 8: Relative Risk of All-Cause Child Mortality by County-Level Family Poverty Rate, 1969-2007



Mortality among children aged 5-14 years also showed a consistently downward trend during 1935-2007, with the rate decreasing from 150.0 deaths per 100,000 population in 1935 to 15.3 in 2007 (Figure 2). The average rate of decline in mortality among children aged 5-14 was 2.7% per year during this period, significantly lower than the pace of

mortality decline for younger children aged 1-4. Although death rates for both white and black children aged 5-14 years declined at a similar pace during 1935-2007, the relative risk of mortality was 33-75% higher among black children than white children during this period. According to the detailed racial/ethnic data in 2007, Asian/Pacific Islander children aged 5-14 years had the lowest death rate (10.9), followed by Hispanics (14.1), non-Hispanic whites (14.2), American Indians/Alaska Natives (17.0), and blacks (21.0). Regarding the trend in sex differentials during the past 6 decades, the relative risk of mortality for male children aged 5-14 years has been approximately 30-70% higher than that for female children.

Leading Causes of Child Mortality

In 2007, unintentional injuries, birth defects, homicide, cancer, and heart disease were the top five leading causes of death of children aged 1-4, accounting for two-thirds of all deaths in 2007 (Figure 3). Deaths from motor vehicle accidents accounted for approximately 37% of all unintentional injury deaths among younger children in 2007 (3). Pneumonia and influenza were the fourth leading cause of death in 1970 (Figure 4). HIV/AIDS, which was not a prominent cause of death in 2007, contributed substantially to young children's mortality from 1987 through 1996 during which the mortality rate from it doubled. While mortality rates from such leading causes of death as unintentional injuries, birth defects, pneumonia and influenza, cancer, and COPD declined by 66-71% between 1970 and 2007, the homicide rate for children aged 1-4 increased by 26%.

Unintentional injuries, cancer, birth defects, homicide, heart disease, and suicide were the leading causes of death of older children aged 5-14, accounting for 70% of all deaths in 2007 (Figure 5). Although HIV/AIDS accounted for only 10 deaths among children aged 5-14 in 2007, it was a leading cause of death for older children in the late 1980s through the mid-1990s. Although mortality from such leading causes of death as unintentional injuries, cancer, birth defects, pneumonia and influenza, and stroke fell by 59-73% between 1970 and 2007, the suicide rate for children aged 10-14 years increased by 44% (Figures 5 and 6). No change in homicide and COPD mortality rates occurred between 1970 and 2007 for older children.

Figure 9: Unintentional Injury Mortality Among Children Aged 1-14 Years by County-Level Family Poverty Rate, United States, 1969-2007

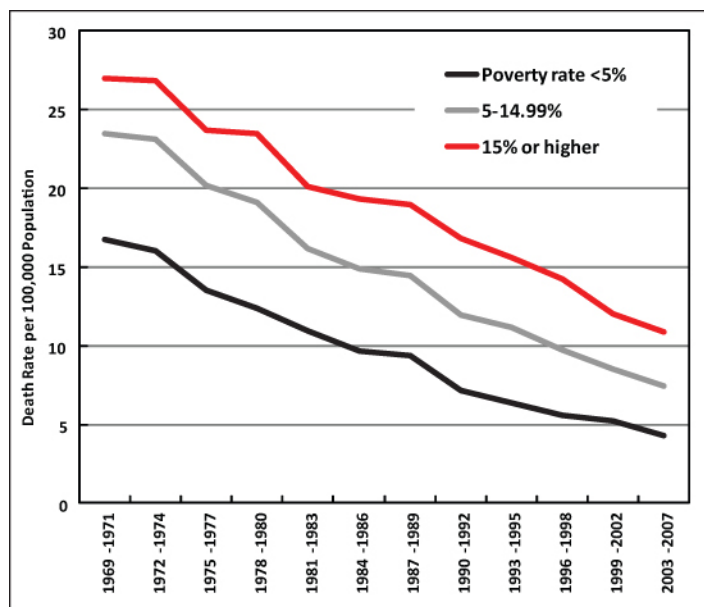
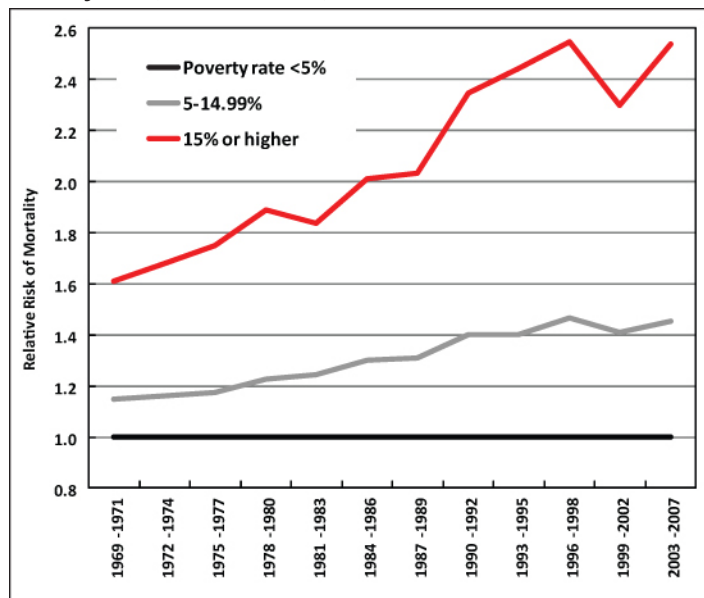


Figure 10: Relative Risk of Unintentional Injury Mortality among Children Aged 1-14 Years by County-Level Family Poverty Rate, United States, 1969-2007



Trends in Socioeconomic Disparities in Child Mortality

Since household socioeconomic data are not available in national mortality statistics, county-level family poverty data from the 1990 and 2000 censuses were linked with county-level mortality data to compute mortality rates from 1969 to 2007 for children aged 1-14 years in three poverty rate categories: <5% (i.e., less than 5% of families

below the poverty level in a county, referred to as the low poverty group), 5-14.99% (middle poverty group), and 15% or higher (high poverty group) [2, 6, 7]. Details of the linkage methodology are provided elsewhere (2). During 1969-2007, the all-cause mortality rate for children in the low poverty group declined by 65.8%, whereas the rate for children in the high poverty group decreased by 57.5% (Figure 7). The slower decline in mortality among higher poverty groups contributed to the widening socioeconomic gap in all-cause child mortality. All relative risks of mortality for the poverty groups were statistically significant. Compared to children in the low poverty group, children in the middle poverty and high poverty groups had 21% and 52% higher all-cause mortality risks in 1969-1971 and 31% and 88% higher all-cause mortality risks in 2003-2007, respectively (Figure 8).

Since unintentional injuries and violence account for nearly 50% of all child deaths, socioeconomic trends in child mortality from unintentional injuries and homicide were also analyzed. Socioeconomic disparities in child mortality from unintentional injuries were greater than those in all-cause mortality. During 1969-2007, unintentional injury mortality rates declined faster for children in the low poverty group compared to children in the higher poverty groups, leading to increased socioeconomic disparities in unintentional injury mortality over time (Figures 9 and 10). Compared to children in the low poverty group, children in the high poverty group had a 61% higher risk of unintentional injury mortality in 1969-1971 but a 154% higher mortality risk in 2003-2007 (Figure 10).

Homicide rates increased from 1969 to 1995 and then decreased through 2007 for children in each socioeconomic group (data not shown). However, the socioeconomic disparities remained large during the entire 1969-2007 time period. Compared to children in the low poverty group, children in the high poverty group had 144%, 195%, and 165% higher homicide rates in 1969-1971, 1990-1992, and 2003-2007, respectively.

Geographic Disparities in Child Mortality

During 2003-2007, the mortality rate for children aged 1-4 varied considerably by state of residence, ranging from a low of 15.5 per 100,000 population for Massachusetts to a high of 49.8 for Mississippi and 46.8 for Arkansas. Young childhood mortality was highest in the Southeastern and Southwestern regions and lowest in New England (Figure 11).

Figure 11: Death Rates per 100,000 Population for Children Aged 1-4 Years, 2003-2007

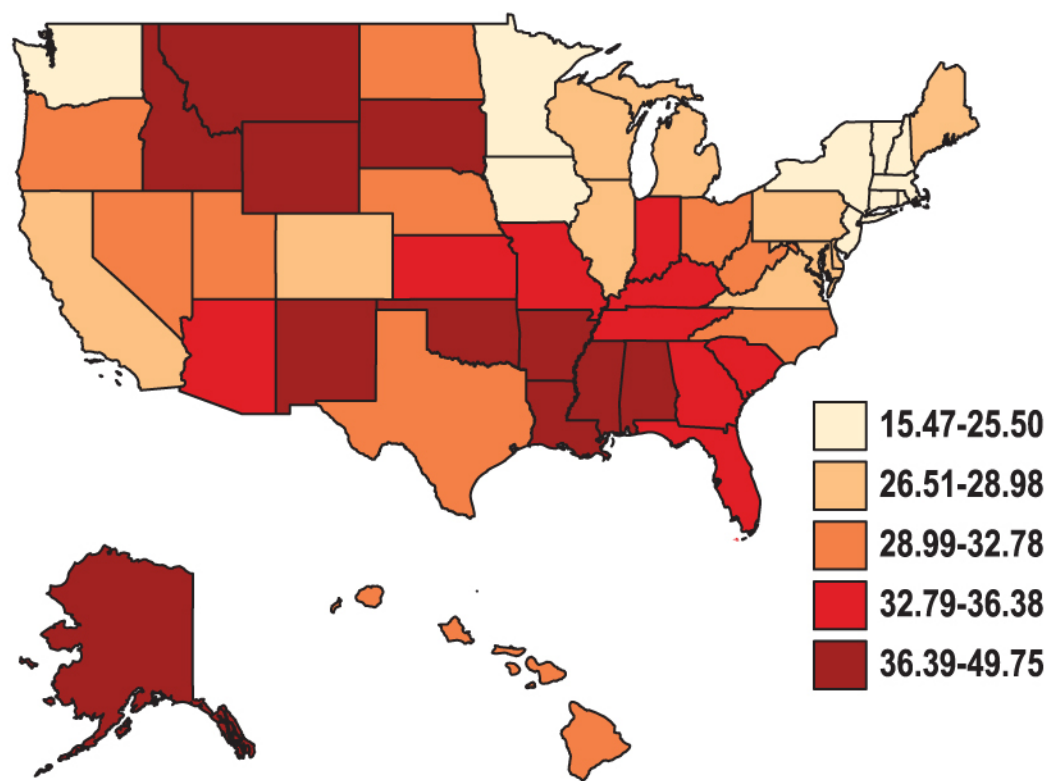
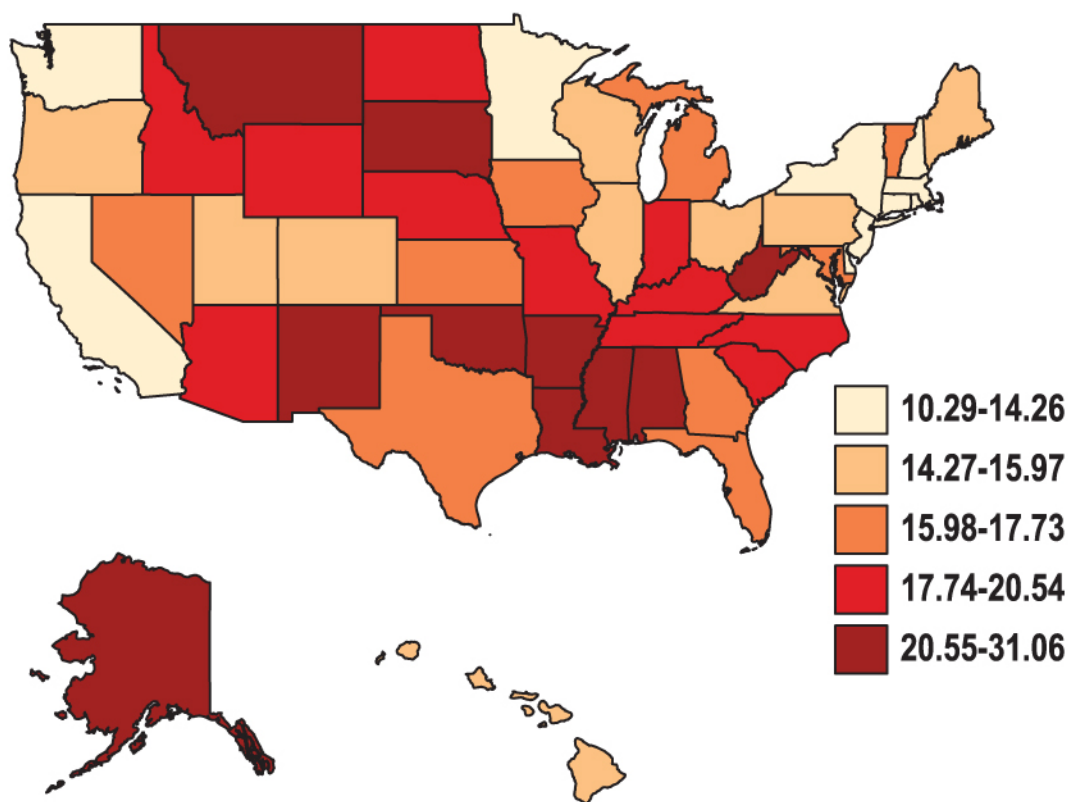


Figure 12: Death Rates per 100,000 Population for Children Aged 5-14 years, 2003-2007



During 2005-2007, mortality among children aged 5-14 was substantially higher in the Southeastern and Southwestern regions and lower in New England, with the rate ranging from a low of 10.3 in Massachusetts to a high of 31.1 in Alaska and 27.0 for the District of Columbia (Figure 12). The geographic pattern in mortality for children aged 5-14 was similar to that for children aged 1-4.

Discussion

Monitoring changes in the health and well-being of children is one of the most important goals of the U.S. Department of Health and Human Services (8). Dramatic reductions in mortality rates over the long term for children in all racial and socioeconomic groups should, undoubtedly, be seen as a major public health success (2). These reductions in the overall child mortality rate were due to large declines in mortality from unintentional injuries, pneumonia and influenza, cancer, and birth defects (1, 2). However, trends in child mortality from violent deaths have been less encouraging as homicide rates for children aged 1-14 and suicide rates for children aged 10-14, even though they are currently lower than the peak rates of the mid-1990s, increased significantly between 1969 and 2007.

Improvements in living conditions, better nutrition, advances in medical care, and the introduction of Medicaid in 1965 have been cited as factors responsible for the long-term decline in child mortality, particularly from such medical or "biologic" causes as pneumonia and influenza, cancer, and birth defects (1, 2). Unintentional injury mortality among children includes deaths due to motor vehicle crashes, accidental drowning, and residential fires, and disparities in mortality from such injuries arise mainly due to social and environmental factors, including socioeconomic disadvantage and poor housing or living conditions (1, 2). Motor vehicle safety improvements, mandatory seat belt

use, efforts to reduce drinking and driving, lower speed limits and increased enforcement, and increased availability of statewide trauma systems have been suggested as factors responsible for the long-term decline in mortality due to motor vehicle crashes (2, 9).

Despite the impressive reductions in overall child mortality over the long term, racial/ethnic, socioeconomic, and geographic disparities in child mortality remain substantial, with black children continuing to experience at least 50% higher mortality risk than their white counterparts. Moreover, socioeconomic disparities in mortality have increased over time, with children in the high poverty group currently experiencing two- to three-fold higher risks of all-cause and unintentional mortality than their more affluent counterparts, respectively. These marked disparities among social groups indicate the potential for further improvements in U.S. child mortality.

Currently, the mortality rates for children in several states as well as in some racial/ethnic groups fall short of the Healthy People 2010 goals – which are set at 20 deaths per 100,000 population for younger children aged 1-4 and 15 deaths per 100,000 population for older children aged 5-14 (8). While none of the major racial/ethnic groups have met the 2010 target set for younger children, the 2007 mortality rates for American Indian/Alaska Native and black children aged 5-14 were 13% and 40% higher than the 2010 target, respectively. In 2007, children in several states such as Alabama, Alaska, Arkansas, Mississippi, Montana, New Mexico, North Dakota, Oklahoma, South Carolina, West Virginia, and Wyoming had at least one-third higher mortality rates than the Healthy People 2010 target. Connecticut, Massachusetts, New Hampshire, and Vermont were the only states in 2007 with lower mortality rates for children aged 1-4 than the national target for the year 2010.

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