



LEADING CAUSES
OF
DEATH AMONG ***CHILDREN***
IN
MISSISSIPPI

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INTRODUCTION

Child deaths in Mississippi are numerous, and the leading causes change dramatically as children age. During the 10-year span from 1992 to 2001, Mississippi lost 9,432 children—an average of 943 deaths per year. Almost half of the deaths (4,566) were to infants. The leading causes of death were short gestation, congenital defects, and sudden infant death (SIDS). For children ages 1 to 19, motor vehicle crashes and other injuries, including those that resulted from fire and burns as well as drowning, were the leading causes of death. Motor vehicle crashes claimed the lives of 1,678 children over the 10-year span, which were 168 deaths per year on average. Fire and burns claimed, on average, 25 lives per year of children ages 1 to 19 in Mississippi. Drowning claimed the lives of 29 children ages 1 to 19 per year, on average. Homicide and suicide were also top causes of death for Mississippi children from 1992 to 2001, and the risks increased with age. On average, seven children ages 1 to 4, two children ages 5 to 9, six children ages 10 to 14, and 41 children ages 15 to 19 died annually from homicide. On average, 27 children ages 10 to 19 died annually as the result of suicide.

Some deaths could be prevented. Philippakis et al. (2004) estimate that one-third of all unintentional childhood injury deaths in the United States are preventable.^{1,2} Of the 9,432 child deaths in Mississippi over the 10-year span, 2,778 were unintentional injury deaths (motor vehicle crashes and “other injuries”^a). Using Philippakis’ estimate, one-third (917) could have been prevented through targeted changes in legislation, public health policy, and individual behavior. This means that an average of 92 lives of children could possibly be saved annually in Mississippi. If the categories of homicide and suicide are also included as preventable deaths, then an average total of 121 children’s lives could possibly be saved annually in Mississippi.

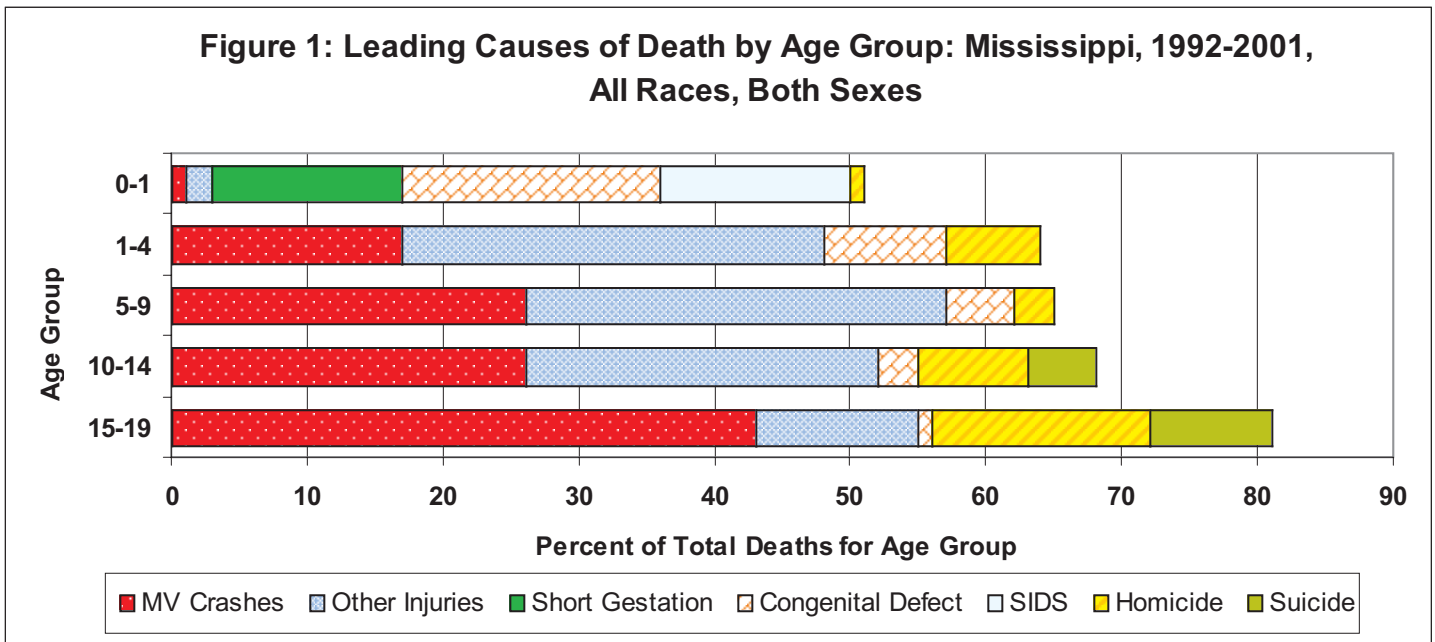
Although the number of children involved in fatal car crashes is high, Mississippi does not have a primary seat belt law, does not require booster seats for children, and exempts anyone in the back seat over the age of 8 from wearing a seat belt or safety restraint. Yet, in contrast, 70% of Mississippi’s adult drivers are in favor of a primary seat belt law. Twenty-six percent of deaths among children ages 10 to 14 and 43% of deaths among children ages 15 to 19 were due to motor vehicle crashes. In 2003, 23% of Mississippi high school students admitted that they never or rarely wear a seat belt; 35% admitted that they rode with someone who had been drinking in the past month; and 13% admitted that they drove after drinking in the past month. Alcohol often plays a role in motor vehicle crashes. In addition to having altered driving abilities, impaired drivers are much less likely to properly secure themselves or child passengers. However, Mississippi does not have a DUI child endangerment law. Additionally, other types of preventable accidents claim the lives of many Mississippi children. With more information about the causes, steps could be taken to reduce these deaths. For example, more knowledge about the circumstances of drowning deaths is needed to guide prevention programs. Increased awareness regarding the conditions that heighten the risk of unintentional fire and burns could also save lives.

^a “Other injuries” include death by suffocation; drowning; being struck by or against an object, including falls; fire or burning; firearms (excluding homicide and suicide); and accidents involving forms of transportation other than motor vehicles.

This report is a survey of publicly available data concerning the leading causes of death among children in Mississippi. For the years of 1992 to 2001, the leading causes of death are examined for five age categories: under 1 year, 1 to 4 years, 5 to 9 years, 10 to 14 years, and 15 to 19 years. Possible intervention strategies are addressed for each leading cause of death.

LEADING CAUSES OF DEATH DIFFER BY AGE GROUP

Figure 1 illustrates how the leading causes of death for the years of 1992 to 2001 varied according to the child's age. The most distinctive change occurred between the infants and toddlers age groups, where the primary causes of death shifted from short gestation, congenital defects, and SIDS for infants to motor vehicle deaths and other injuries for toddlers and older children. **Motor vehicle crashes** were the second highest cause of death for those ages 1 to 4, accounting for 18% of all deaths, and **were the leading cause of death for those ages 10 to 14 and 15 to 19**. Other injuries were most dangerous for those ages 1 to 9 and were responsible for almost a third of all deaths in those age categories. The birth- and infancy-specific causes (short gestation, congenital defects, and SIDS) of death, while responsible for almost half of all infant deaths, were much less prevalent by age 10. Taking their place as leading causes of death were motor vehicle accidents, other injuries, homicide, and suicide. Together, homicide and suicide were responsible for 12% of the deaths among those ages 10 to 14 and 26% of the deaths among those ages 15 to 19.



Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Table 1 provides the leading causes of death by age for the time period of 1992 to 2001 in more detail.

Table 1: Leading Causes of Death by Age Category, Mississippi, 1992-2001

Age	MV Crashes	Other Injuries	Short Gestation	Congenital Defect	SIDS	Homicide	Suicide	Percent of All Deaths	Deaths, All Causes
0<1	63	112	654	889	648	44	0	52%	4,566
1-4	179	317	0	91	0	70	0	64%	1,025
5-9	145	173	0	23	0	19	2	65%	560
10-14	196	191	0	24	0	58	34	68%	740
15-19	1,095	307	0	27	0	410	240	81%	2,541
TOTAL	1,678	1100	654	1,054	648	600	276	64%	9,432

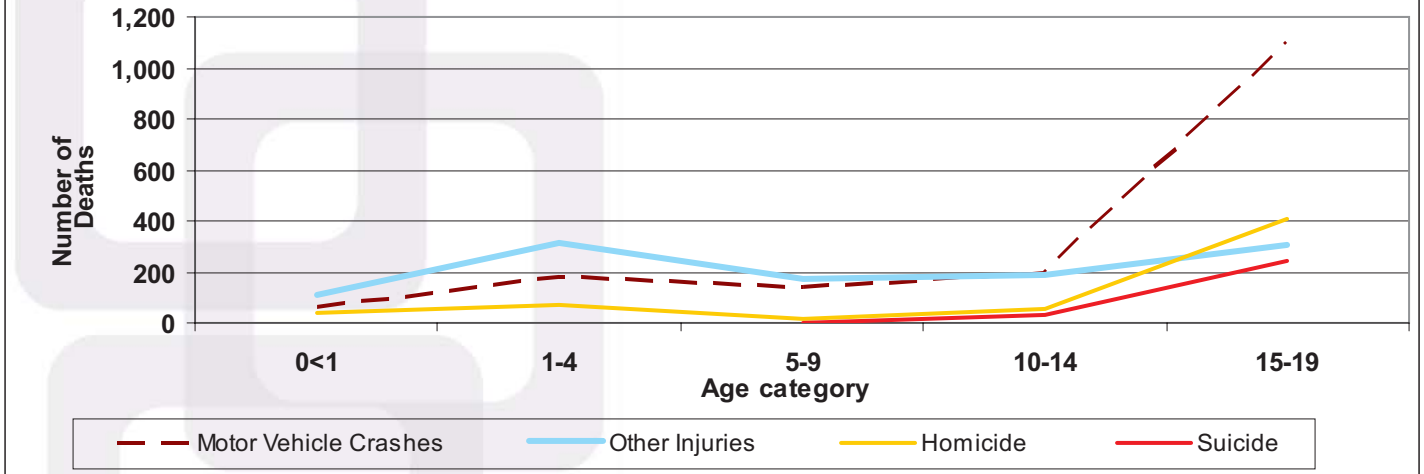
Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Preventable Deaths

An important subset of deaths is preventable unintentional injury deaths. Philippakis et al. (2004) examined childhood injury deaths by cause among regions of the country. Using the Northeast, with its relatively low rate of injury, as the region to which others were compared, the researchers concluded that some injury deaths could be prevented in the other regions. That is, if other regions of the country had higher education levels of parents; lower gun ownership; higher population density and, therefore, shorter distances traveled by car; a better developed emergency system; and the existence of several injury-specific prevention programs, then their unintentional childhood injury death rate could be cut by up to one-third.

The conclusion that tailored prevention programs are needed for each age group is further supported when the categories of preventable injury deaths are isolated and examined over time, by age category. Motor vehicle crashes became the leading cause of preventable death (over "other injuries" combined) for the age category of 10 to 14. These deaths increased dramatically over the 10-year period, from 196 among 10- to 14-year-olds to 1,095 among 15- to 19-year-olds. The category of other injuries fluctuated between 100 and just over 300 deaths for all age categories throughout the 10-year period. Similar to motor vehicle crashes, homicides jumped dramatically with age, increasing almost 10 times from 44 homicides of infants ages 0<1 to 410 homicides of adolescents ages 15 to 19. Likewise, suicide increased to 240 deaths among adolescents. If one-third of all deaths due to preventable motor vehicle crashes, other injuries, homicides, and suicides were prevented, the lives of 1,206 children would have been saved over the 10-year period. In other words, assuming that one-third of all "preventable" deaths among children in Mississippi were actually avoided, an average of 121 children's lives would have been saved every year during the years of 1992 to 2001. The public's perception of the proportion of preventable deaths is higher, more than 50%. In 2001, adults felt that 62% of motor vehicle crash deaths, 67% of drownings, and 62% of fire/burn fatalities were preventable.³

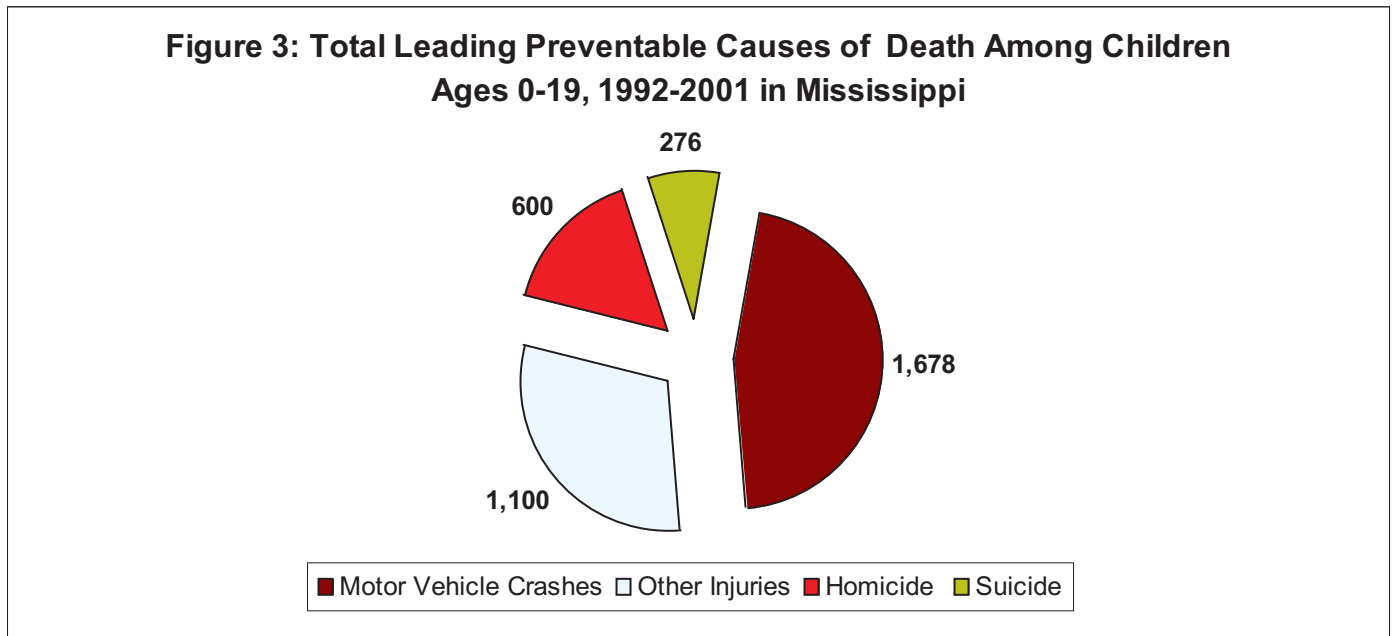
Figure 2: Preventable Injury Deaths in Mississippi by Age Category, 1992-2001, Ages 0-19



Source: Calculations based on “20 Leading Causes of Death, 2001, All Races, Both Sexes,” and “20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes.” Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Examining the 10-year period by preventable injury death categories, motor vehicle crashes accounted for 46% of all preventable deaths among children in the state of Mississippi. This cause claimed 1,678 lives of children in 10 years. The category of other injuries was responsible for 30% of all preventable deaths among children. Homicide was responsible for 16% of all preventable injury deaths, while suicide was responsible for 8% of all preventable deaths.

Figure 3: Total Leading Preventable Causes of Death Among Children Ages 0-19, 1992-2001 in Mississippi



Source: Calculations based on “20 Leading Causes of Death, 2001, All Races, Both Sexes,” and “20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes.” Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

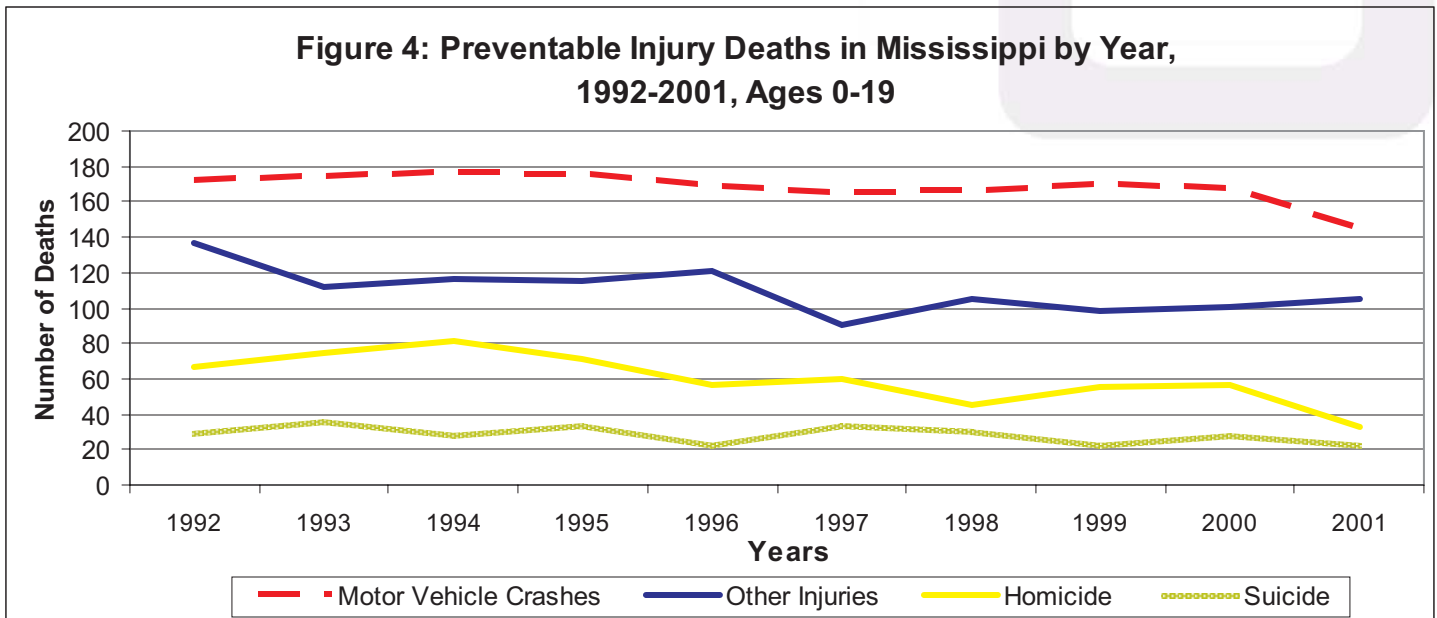
Table 2 provides total number of deaths due to preventable unintentional injuries by age category for the period of 1992-2001.

Table 2: Age-Specific Totals for Preventable Unintentional Injury Deaths, 1992-2001

Age	Motor Vehicle Crashes	Other Injuries	Homicide	Suicide	TOTAL
0<1	63	112	43	0	218
1-4	179	317	70	0	566
5-9	145	173	19	2	339
10-14	196	191	58	34	479
15-19	1,095	307	410	240	2,052
TOTAL	1,678	1,100	600	276	3,654

Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Figure 4 illustrates trends across 10 years for the four leading causes of preventable unintentional injury deaths in Mississippi. The total number of deaths in these four categories declined from 404 in 1992 to 305 in 2001.



Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Most Common Causes of Death for Children Under 1 Year Old

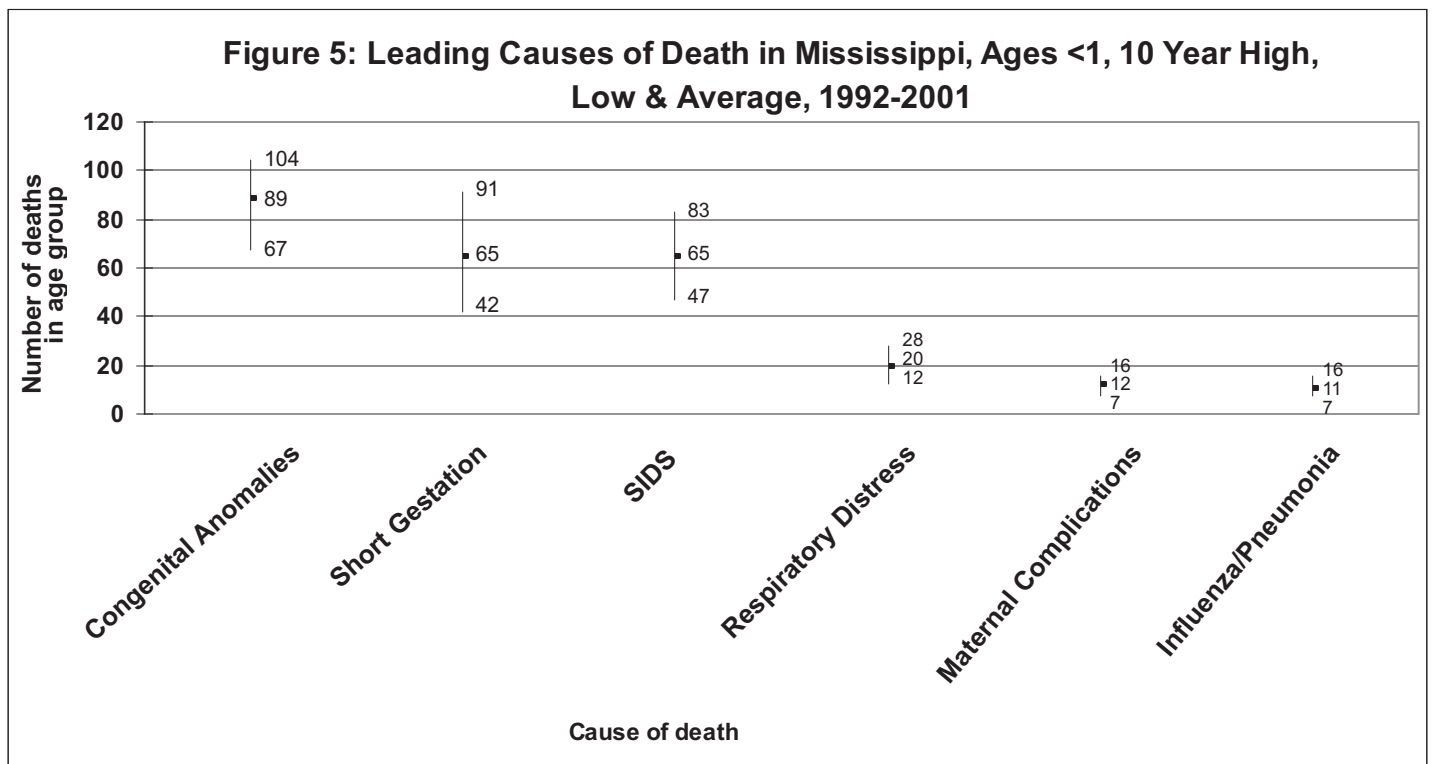
According to researchers at the Centers for Disease Control (CDC), "Infant mortality, the risk of death during the first year of life, is related to the underlying health of the mother, public health practices, socioeconomic conditions, and availability and use of appropriate health care for infants and pregnant women."⁴ Health

⁸ Impacts broken down by major sector for each region are available from the authors upon request.

outcomes may be as much a result of population density as of demographics and socioeconomic factors. One major study determined that nonmetropolitan mothers were more likely than metropolitan mothers to delay prenatal care until the third trimester, and this difference held after controlling for race, maternal age, marital status, and maternal education.⁵ Therefore, the causes of infant health outcomes are complex and not attributable to one easily identifiable or preventable cause.

Infant mortality risks in the first year of life can be divided into the first month (neonatal mortality) and after the first month (postneonatal mortality). Short gestation, maternal pregnancy complications, and respiratory distress were leading causes of death in the neonatal period, while congenital anomalies, SIDS, and respiratory distress were leading causes of death in the postneonatal period.⁶

Figure 5 illustrates the range and average of the leading causes of death in Mississippi among newborns for a 10-year period. Congenital anomalies accounted for an average of 89 deaths per year, out of an average yearly total of 457 deaths in this age category. While it was the number one cause of death for many years, it has recently been on the decline. Note that these categories are capable of wide swings across time. While these fluctuations are normal, they do affect the absolute ranking of leading causes of death in any one year. Short gestation (premature babies) averaged 65 deaths per year and has been on the increase, overtaking congenital anomalies as the leading cause of death among infants in Mississippi in 1999. Of the very premature babies that do survive, almost half have moderate to severe disabilities. SIDS ranked as the third leading cause of death. Trailing causes of death were respiratory distress, maternal complications, and influenza/pneumonia.



Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

The leading causes of death among infants from birth to one year old are shown in by year in Table 3.

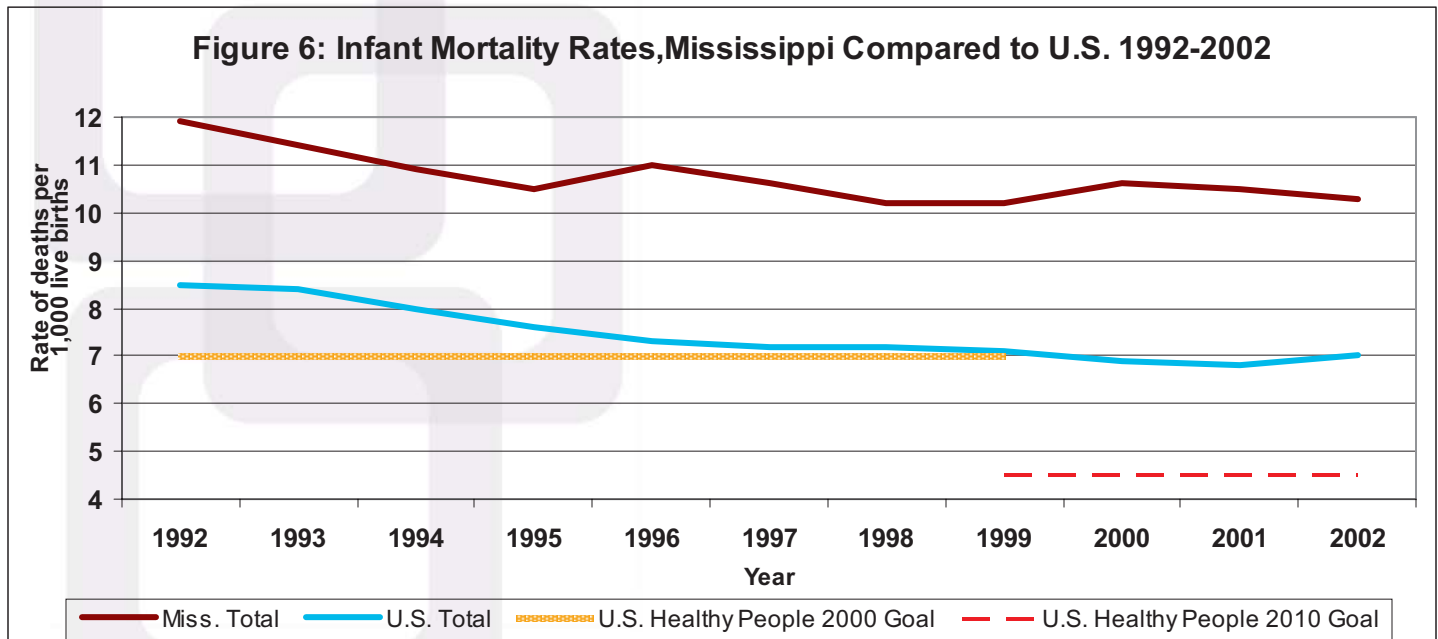
Table 3: Leading Causes of Death, Age <1, 1992-2001, Number of Deaths

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Avg.
Congenital Anomalies	96	97	94	98	104	92	78	67	85	78	89
Short Gestation	62	55	42	43	57	57	78	82	87	91	65
SIDS	83	75	80	64	47	53	61	67	64	54	65
Respiratory Distress	28	22	21	14	20	23	22	17	18	12	20
Maternal Complications	11	16	11	7	11	9	8	16	13	14	12
Influenza/Pneumonia	7	11	16	14	7	15	13	9	11	7	11
Suffocation	9	4	8	6	12	5	7	7	8	9	8
Motor Vehicle Crashes	6	12	10	3	7	5	2	5	5	8	6
Homicide	6	3	4	1	3	5	6	5	6	5	4
Circulatory Disease	0	0	0	0	0	0	2	11	13	11	4
Drowning	3	0	1	2	0	0	0	0	1	1	1
All Deaths <1	509	484	460	436	452	442	435	433	470	445	457

Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Racial Comparisons of Birth Rates in Mississippi

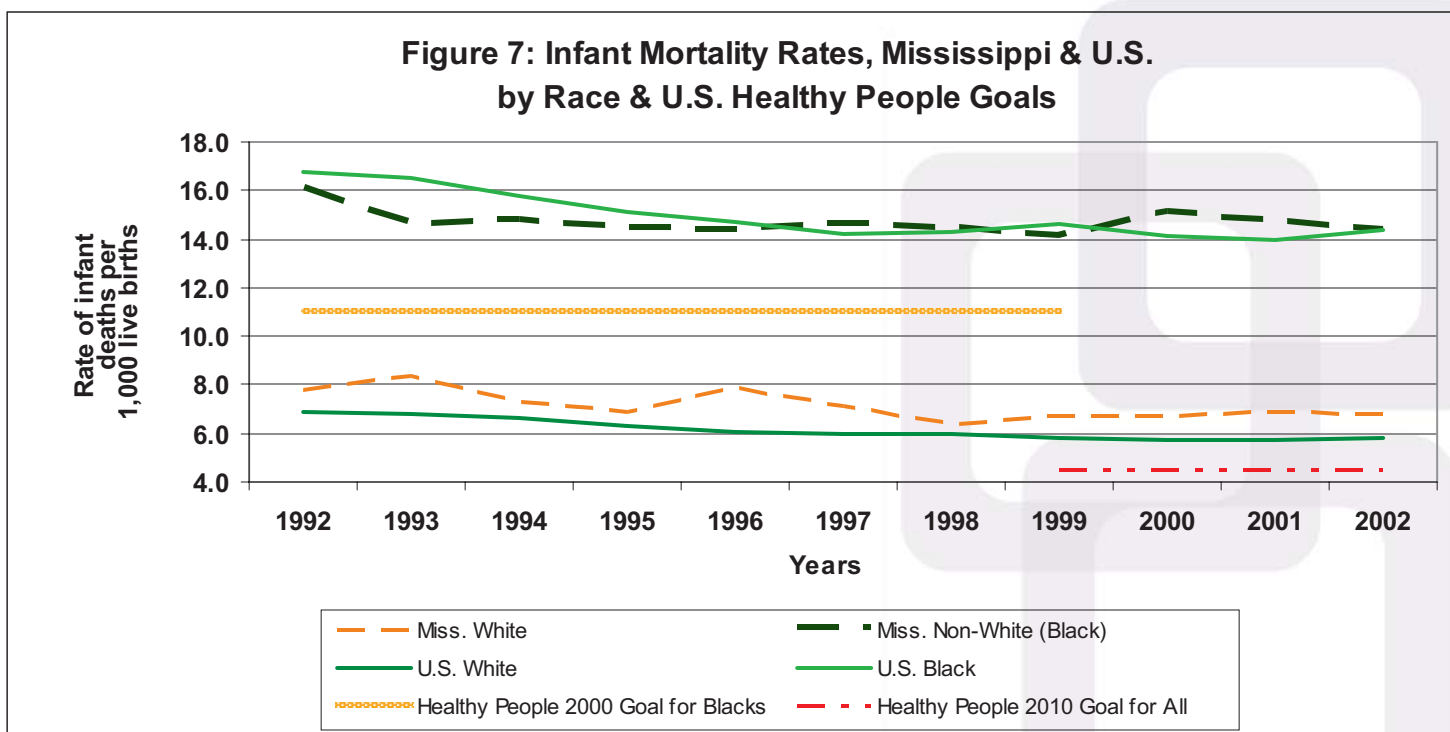
As seen in Figure 6, infant mortality rates (IMR) for both Mississippi and the United States trended downward across the 10-year period. Mississippi began the period with an IMR of 11.9 and declined to 10.5 in 2001, a drop of 1.4.⁸ The United States began the period with an IMR of 8.5 and dropped to 6.8, a decline of 1.7.⁹ The Healthy People 2000 Goal was 7.0 deaths per 1,000 live births, a goal which was attained by the total U.S. in 2000; the Healthy People 2010 Goal has been set at 4.5 deaths per 1,000 live births—for all population groups.¹⁰



Sources: "Table 23: Infant Deaths and Mortality Rates, by Year and Race, Mississippi, 1917-2001." Mississippi State Department of Health. Available at: <http://www.msdh.state.ms.us/phs/2001/bulletin/bul23.htm> "Table 30: Infant, Neonatal, and Postneonatal Mortality Rates by Race and Sex: United States, 1940, 1950, 1960, 1970 and 1975-2002." Deaths: Final Data for 2002. National Vital Statistics Report, Vol. 53, No. 5, October 12, 2004. Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_05.pdf "Table 14: Maternal and Infant Health Objectives." National Center for Health Statistics. Healthy People 2000 Final Review. Hyattsville, Maryland: Public Health Service. 2001. Available at <http://www.cdc.gov/nchs/products/pubs/pubd/hp2k/hp2k.htm> "Table 16-01c." The Healthy People 2010 Database. Division of Health Promotion Statistics. National Center for Health Statistics. Centers for Disease Control. July 2004 edition. Available at: <http://wonder.cdc.gov/data2010/objfoch.htm>

Figure 7 illustrates IMRs disaggregated by race. The Mississippi Non-White (i.e., African American) IMR rate flattened, while the U.S. African American IMR continued to decline. The time period ends with rates of 14.7 and 14.0, respectively. Neither has approached the Healthy People 2000 IMR Goal for African Americans of 11.0 deaths per 1,000 live births. The Healthy People 2010 Goal for IMRs for all groups has been revised downward to 4.5 deaths per 1,000 live births. The U.S. IMR for Whites has also trended downward. The more volatile Mississippi rate appears to have flattened between 6.4 and 6.9. This data brings into sharp focus both the persistence of the "Black-White gap," as well as the public health challenges.

Figure 7: Infant Mortality Rates, Mississippi & U.S. by Race & U.S. Healthy People Goals



Sources: "Table 23: Infant Deaths and Mortality Rates, by Year and Race, Mississippi, 1917-2001." Mississippi State Department of Health. Available at: <http://www.msstate.ms.us/phs/2001/bulletin/bul23.htm>
 "Table 30: Infant, Neonatal, and Postneonatal Mortality Rates by Race and Sex: United States, 1940, 1950, 1960, 1970 and 1975-2002." Deaths: Final Data for 2002. National Vital Statistics Report, Vol. 53, No. 5, October 12, 2004. Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_05.pdf
 "Table 14: Maternal and Infant Health Objectives." National Center for Health Statistics. Healthy People 2000 Final Review. Hyattsville, Maryland: Public Health Service. 2001. Available at <http://www.cdc.gov/nchs/products/pubs/pubd/hp2k/hp2k.htm>
 "Table 16-01c." The Healthy People 2010 Database. Division of Health Promotion Statistics. National Center for Health Statistics. Centers for Disease Control. July 2004 edition. Available at: <http://wonder.cdc.gov/data2010/objfoch.htm>
 Note: The Mississippi State Department of Health reports IMR by two racial categories, White and Non-White, whereas the Centers for Disease Control report multiple categories of race. However, in the case of Mississippi, the number of individuals who are neither White nor African American is so small as to render the Non-White category equivalent to African American.

One view of Mississippi’s high rates of infant mortality compared to the rest of the nation is provided by Dr. Owen B. Evans, Chairman of Pediatrics at the University of Mississippi Medical Center, who states, “Although the infant mortality rate for all infants in Mississippi is near the highest in the United States, the difference in race-specific infant mortality rates is closer to the national average. Black infant mortality is about twice that of white infant mortality in all parts of the United States. The fact that the Black population is a larger percentage in Mississippi compared with every other state skews our rates toward that of the Black infant mortality rate more than those states with a smaller Black population.”¹¹ In Mississippi, the ratio of Non-White to White IMR has remained close to 2.1, while the U.S. ratio of African American to White IMR has increased slightly to 2.5.

African American mothers in Mississippi are more likely to be teenaged, be in poverty, and have less prenatal care in the first trimester than their White counterparts. As seen in Table 4, nearly 60% of births to teenaged mothers in Mississippi were to African Americans, and 40% were to Whites. In Mississippi, the African American IMR was twice as high as the White IMR. Among the factors contributing to the discrepancy in rates were higher percentages of preterm births and low-birthweight infants among African Americans.

Table 4: Birth Statistics in Mississippi by Race and Ethnicity

MEASURE	WHITE	AFRICAN AMERICAN	OTHER
Percent distribution of births, 2002	53.4%	43.0%	3.6%
Birth rate per 1,000 population, 2002	12.6	17.2	19.2
Percent distribution of teen births, 2002	40.0%	58.3%	1.7%
Rate of teen births per 1,000 population, 2002	49.2	82.4	79.8
Preterm births as a percent of live births, 2001	13.8%	20.9%	13.2%
Percentage of mothers beginning prenatal care in the first trimester, 2002	90.7%	76.1%	74.7%
Infant death rate (per 1,000), 2001*	7	14.9	n/a
Low-birthweight infants, 2002	8.2%	15.2%	5.7%

*The state's total (blended) rate of infant mortality was 10.5/1,000.

Source: State Health Facts Online, The Henry J. Kaiser Family Foundation. Available at: <http://www.statehealthfacts.kff.org/>

Prematurity is the leading cause of infant mortality among African American infants in the United States.¹² A recent study found that infants of African American mothers were nearly 4 times as likely as infants of White mothers to have a cause-specific mortality rate for low birthweight.^b The rate of preterm births increased in all states in the last decade, and Mississippi is 1 of 14 states with a preterm rate of more than 13%, above the U.S. average of 12.1%.¹³ Risk factors for prematurity include a history of preterm birth, maternal age (teenaged or advanced), multifetal pregnancy, stress, infection, smoking, and obesity. Additional behavioral and genetic causes are continuing to be investigated. To address the changing composition of infant mortality in the United States, the March of Dimes, the American Academy of Pediatrics, the American College of Obstetricians and Gynecologists, and the Association of Women's Health, Obstetric and Neonatal Nurses have undertaken a 5-year, \$75 million national awareness campaign concerning the causes and consequences of prematurity.^{14,15}

International Comparisons of IMR

A snapshot comparison of Mississippi's IMRs in 1999 to that of other countries brings into focus the relative differences in race-based IMRs.^c While a White infant born in Mississippi in 1999 faced IMRs that were slightly higher than developed countries such as Cuba (6.4) and Northern Ireland (6.4), a Non-White infant faced double the infant mortality rate (14.1), or a rate similar to Bulgaria.¹⁶ As a reference point, the 2010 national target for all populations is an IMR of 4.5 deaths per 1,000 live births, as set by the U.S. Department of Health and Human Service's "Healthy People 2010".¹⁷

^b "Infants born too small or too soon have a much greater risk of death and both short-term and long-term disability than those born at term (37-41 weeks of gestation) or with birthweights of 2,500 grams or more," (Mathews, et al., 2003, p. 5).

^c It must be noted that these rates are not calculated in exactly the same way. Other countries, following W.H.O. recommendations, do not record live births that are under 1,000 grams, while the U.S. does. Additionally, the U.S. medical system treats premature and underweight births more aggressively and with more technology than do other country's health systems. Thus, an underweight child that was born and immediately died would not be recorded as a live birth in other countries.

Table 5: Comparison of Mississippi’s Infant Mortality Rates (IMRs) to the IMRs of Other Countries

COUNTRY	IMR*	INTERNATIONAL RANKING
Romania (1999)	18.6	37
Russian Federation (1999)	17.1	36
United States, African American (1999)	14.6	
Bulgaria (1999)	14.5	35
Mississippi, Non-White (1999)	14.1	
Puerto Rico (1999)	10.6	33
Chile (1999)	10.1	32
Mississippi, White (1999)	6.7	
Cuba (1999)	6.4	26
Northern Ireland (1999)	6.4	26
United States, White (1999)	5.8	
Germany (1999)	4.5	10
Japan (1999)	3.4	2
Hong Kong (1999)	3.1	1

Sources: Mississippi infant mortality rates from “Table 23: Infant Deaths and Mortality Rates, by Year and Race, Mississippi, 1917-2001.” Mississippi State Department of Health. Available at: <http://www.msdh.state.ms.us/phs/2001/bulletin/bul23.htm>.

International infant mortality rates from Table 25: Infant mortality rates and international ranking: Selected counties, selected years 1960-99.

National Center for Health Statistics, Health, United States, 2003, Hyattsville, MD. October 2003. Available at: <http://www.cdc.gov/nchs/products/pubs/pubd/hus/trendtables.htm>. U.S. rates from Table 1: Infant Mortality and Low Birth Weight Among African American and White Infants—United States, 1980-2000. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5127al.htm>

*Infant Mortality Rate (IMR) is the number of infant deaths per 1,000 live births.

Some of the interventions necessary to reduce infant mortality are well known. Most strategies involve improved access to prenatal care, the reduction of teen pregnancy, increased health literacy, the associated reduction of poverty and health care inequality, and the timely provision of medical care. In 2001, Mississippi ranked in the bottom half (36th out of 50 states) in terms of financial expenditures for public welfare, health, and hospitals.¹⁸

Most Common Causes of Death for Children Over 1 Year Old

Motor Vehicle Deaths

The major contributors to motor vehicle deaths are well documented. Human behavior, including improper seat belt use, excessive speed, alcohol use, and irresponsible driving, is a major factor in vehicle accidents, injuries, and deaths.¹⁹ Mississippi’s motor vehicle drivers and occupants face a second danger—rural roads. Although nationally only a third of motor vehicle crashes occur on rural roads, two-thirds of motor vehicle crash deaths occur on rural roads.²⁰ Almost 70% of Mississippi’s roads are classified as rural. A recent study by the General Accounting Office (GAO) investigated the four primary factors that are responsible for rural road crashes: human behavior, roadway environment, vehicles (e.g., roll-overs^d), and medical care received after the crash.²¹ The report concluded that a primary problem is that some states have not adopted seat belt, child restraint, and drunk driving laws shown to be effective in curbing dangerous driving behavior.

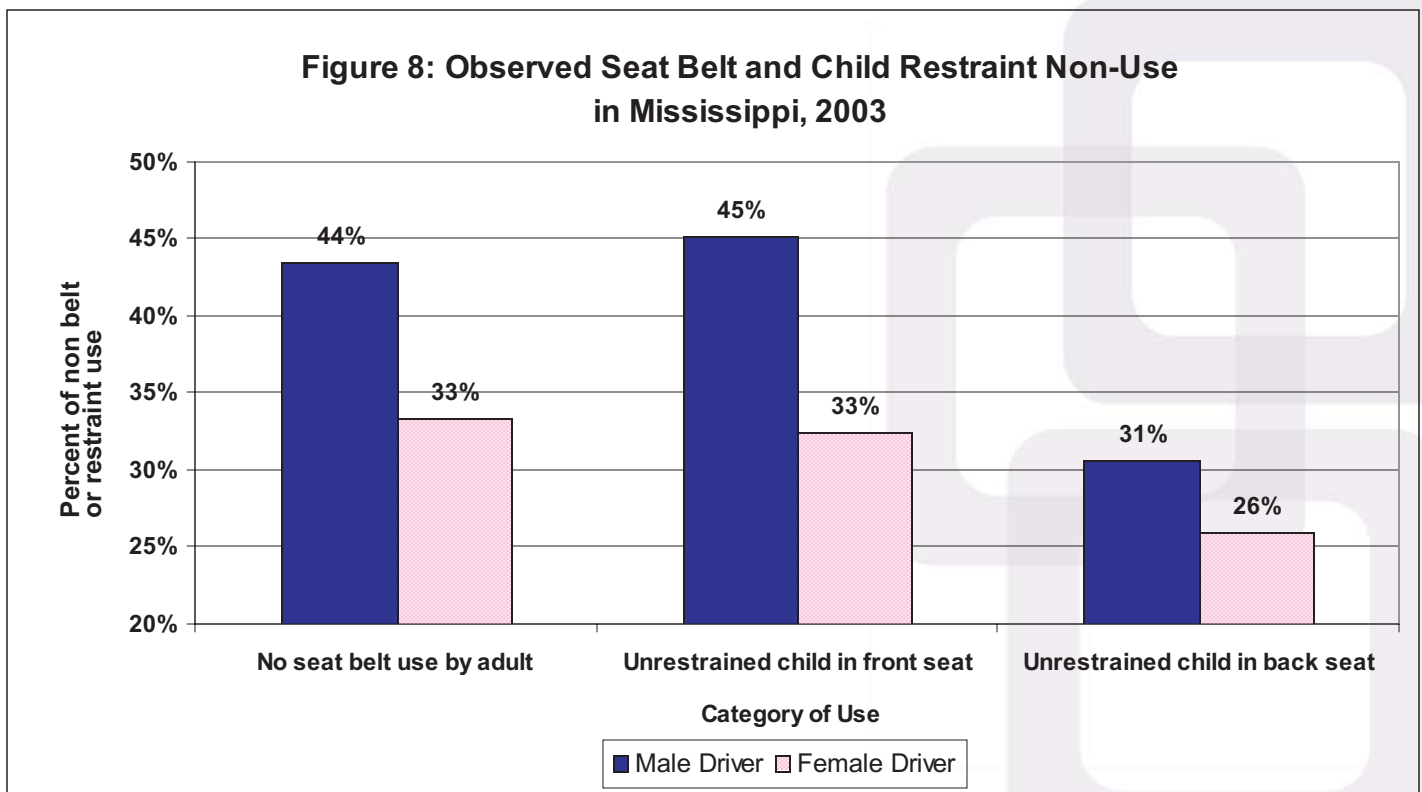
^d The most recent vehicle crash figures indicate that 37% of SUVs in fatal crashes rolled over, compared to 16% of passenger cars (2003 Early Assessment Estimates of Motor Vehicle Crashes, NHTSA, May 12, 2004).

Echoing the national report, at the state level, one of the reasons for Mississippi's high motor vehicle death rate (the second highest in the nation) is that many adults do not use seat belts, and infants and children are not properly restrained. Three separate surveys of drivers in Mississippi show that a consistent percentage of drivers (25%-37%) do not buckle up or restrain their children. From these surveys, statistics show that:

- 25% of adults did not use their seat belts at least once "within the past day or week" (Click It or Ticket Survey, June 2003)²²
- 25% of adults do not "always wear seat belts" (Drink, Drive, Lose Survey, July 2003)²³
- 37% of adults were directly observed as not using a seat belt (Mississippi Child Restraint Survey [MCRS], 2003)²⁴
- 37% of children observed in the front seat were unrestrained (MCRS, 2003)
- 27% of the children observed in the back seat were unrestrained (MCRS, 2003)

Adult behavior directly affects the crash outcome for minors. In the most recent study by the National Highway Traffic Safety Administration (NHTSA), when the adult was wearing their seat belt, 92% of children were properly restrained.²⁵ When the adult was not wearing their seat belt, only 62% of children were properly restrained. In another NHTSA study, for fatal crashes with accompanying seat belt use statistics, restrained drivers were 39% to 44% more likely to also restrain their child passengers.²⁶ The Society for Automotive Engineers, in an independent study, found the same association between adult seat belt usage and child restraint usage among those who did not use restraints.²⁷ A national analysis of fatal crashes conducted by the NHTSA found that among fatally injured children, those with an unrestrained driver were 2 to 2.5 times more likely to also be unrestrained.²⁸ The association was even higher for infants and toddlers. A separate study by the NHTSA found that infants were 3.7 times more likely to be unrestrained when the driver was also unrestrained.²⁹

Within the state of Mississippi, a child restraint survey is conducted annually by the Office of Highway Safety, Division of Public Safety Planning, Mississippi Department of Public Safety. In 2003, a total of 6,573 observations were made at 261 separate locations in 30 municipalities. Those observations revealed that between 33% and 44% of adult drivers were not wearing seat belts. Additionally, child passengers were unrestrained in 26% to 45% of the observations. Sorting these observations by the sex of the driver, regardless of their seat belt usage, indicates that male adult drivers were more likely to not use their seat belt and also to have an unrestrained child in the vehicle.



Source: Landrum, James W., and Parrish, David R. 2003. 2003 Mississippi Child Restraint Survey Final Report. Prepared for the Office of Highway Safety, Division of Public Safety Planning, Mississippi Department of Public Safety.

Unintentional Drowning

According to a technical report by the American Academy of Pediatrics, drowning was the second leading cause of unintentional injury deaths from 1990 to 2000 for all children between the ages of 1 and 19 in the United States.³⁰ One hospital-based study concluded that near-drowning injuries have relatively high fatality rates.³¹ Of the children who suffered near-drowning and required cardiopulmonary resuscitation at the emergency room, at least half of the survivors suffered significant neurological impairment.³² Medical costs for the treatment of near-drowning can range from \$4,000 for a victim who fully recovers to \$160,000 for a victim with severe brain damage and can exceed \$300,000 in the case of extended hospital stays.³³ Of the unintentional injury deaths, drowning has the greatest seasonal variation³⁴; two-thirds of drowning deaths to those under age 15 occur between May and August. These drownings also tend to occur on the weekend.³⁵

Age plays a role in the location and circumstances of drownings. According to a Consumer Product Safety Commission publication on the prevention of child drownings, “Toddlers, in particular, often do something unexpected because their capabilities change daily.”³⁶ Among infants, most drownings occur in the home, in either the bathtub or a bucket. In contrast, more than half of the children between the ages of 1 and 4 drown in swimming pools, and more than one-quarter drown in lakes, ponds, and rivers.^{37,38} Access to water determines the potential risk to children, such that in affluent communities more drownings likely occur in backyard pools

and lakes. In less affluent communities, more drownings likely occur in bathtubs, buckets, and ditches. In landlocked communities, more drownings likely occur in freshwater, while in coastal communities saltwater drownings would be expected to present a greater threat.³⁹ In terms of injury prevention, each circumstance would be addressed in a different fashion.

Unintentional Fire and Burns

Most fatalities in fires are from inhalation of smoke or toxic gases.⁴⁰ Approximately 79% of all U.S. fire deaths occur in the home.⁴¹ Cooking is the primary cause of residential fires; smoking is the leading cause of fire-related deaths.⁴² Approximately 94% of homes in the United States have at least one smoke alarm, and approximately half of home fire deaths occurred in homes without smoke alarms (6% in the United States).⁴³ Most residential fires occur during the winter months.⁴⁴ Alcohol use (by adults) contributes to an estimated 40% of residential fire deaths.⁴⁵ Households with non-working smoke alarms now outnumber those with no smoke alarm, and missing, dead, or disconnected batteries are the leading causes of smoke alarm failure.⁴⁶

Some of the groups that are at increased risk of fire-related injuries and deaths are children ages 4 and under, African Americans,⁴⁷ people with low socioeconomic status,⁴⁸ people in rural areas,⁴⁹ and people living in manufactured homes or substandard housing.^{50,51} Almost 55% of children ages 5 and under who die from home fires are asleep at the time, and nearly one-third of these children are too young to react appropriately (e.g., a toddler).⁵² The Federal Emergency Management Agency (FEMA) has announced a new fire prevention public education campaign, noting that communities with fewer than 2,500 residents have a per-person fire death rate that is almost twice the national average.⁵³ In Mississippi, rural African American children (under the age of 5) are twice as likely to die in a residential fire as non-rural African American children.⁵⁴ To combat this cause of death, the State Fire Marshall's office, through the Fire Safety Division, is reinvigorating several educational programs, including the "Learn, Not Burn" campaign in Head Start programs, the "Risk Watch" program, and the FEMA sponsored "Prepare, Practice, and Prevent the Unthinkable."

Homicide

Homicides of infants and children have been linked to unwanted pregnancy, poverty, and relative deprivation.⁵⁵ Based on studies from the FBI's Supplementary Homicide Reports, in 1994 (the most recent analysis available) 55% of homicide victims under the age of 18 were killed by someone in their own age group.⁵⁶ According to research conducted by the CDC, having a gun in the home is associated with an increased risk of homicide by firearm, as well as suicide by firearm in the home.⁵⁷ Goals for the reduction of homicides and firearm-related deaths have been set by the federal government as part of its Healthy People 2010 initiative, but the goals are for the entire population and do not specifically address the subpopulation of youth.^{58,59} However, for reference purposes, the national 2010 goal for homicide rates is 3.0 homicides per 100,000. Mississippi's rate in 2000 was 8.96 homicides per 100,000.⁶⁰ Nationally, African Americans are at greater risk. They are overrepresented both as victims and as perpetrators of firearm-related homicide.⁶⁰

Suicide

Nationally, suicide rates have declined from 1992 to 2001; however, suffocation has surpassed firearms as the most common method among those ages 10 to 14.^{f,61} Goals for the reduction of teen suicide attempts have been set by the federal government as part of its Healthy People 2010 initiative. The national goal is to reduce reported teen (grades 9 through 12) suicides to 1% of all deaths. The 1999 national rate was 2.6%. The number of teen suicide attempts in Mississippi was not reported. Nationally, more than half of adolescent (ages 14-20) suicides are via firearms. A national research study found that child access prevention (CAP) laws that require the safe storage of firearms were associated with a modest reduction in suicide rates, while minimum age restrictions for the purchase and possession of firearms did not appear to reduce suicide rates.⁶³ However, an earlier analysis of individual states found that CAP laws were not effective in reducing unintentional firearm deaths.⁶⁴ Mississippi does not have CAP laws in place.⁶⁵

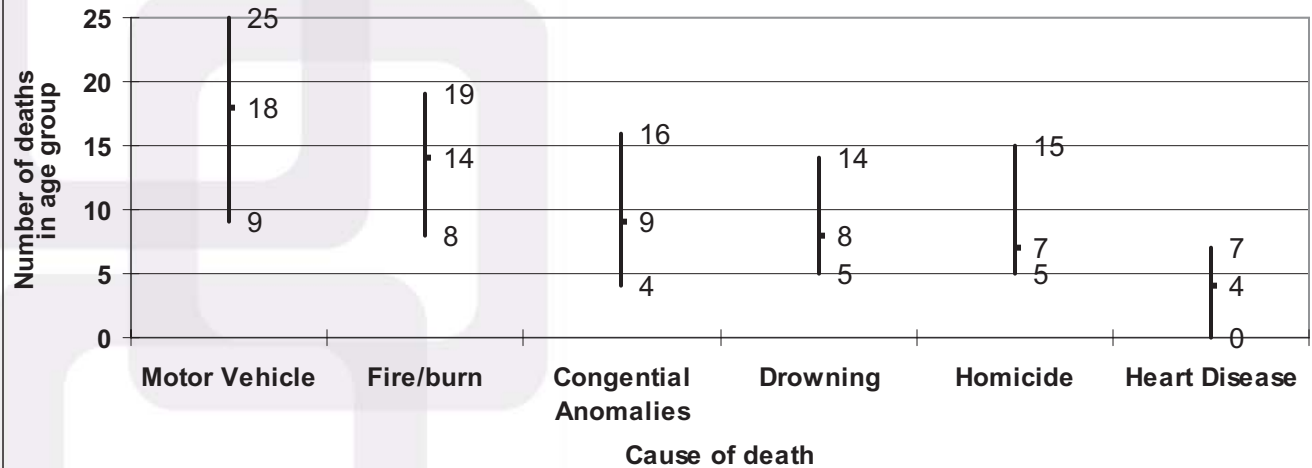
Ages 1 to 4

Figure 9 illustrates the ranges and averages of the leading causes of death in Mississippi among children ages 1 to 4 for a 10-year period. When other injuries were broken down into separate categories, motor vehicle crashes consistently ranked as the leading cause of death, accounting for an average of 18 deaths per year. Fire and burn deaths averaged 14 per year. Congenital anomalies were the third leading cause of death, causing an average of 9 deaths per year. Averaged across 10 years, drowning was the fourth leading cause of death. Trailing causes of death were homicide and heart disease. An average of 57 deaths per year is categorized as preventable in this age group; therefore, 19 lives of children could possibly be saved annually through targeted prevention programs.

^eThe rate was calculated as follows. According to the Bureau of Justice Statistics web page, Mississippi had 255 homicide victims in 2000. The state's population in 2000 was 2,844,658. The formula is: $(255/2,844,658) * 100,000 =$ homicide rate per 100,000.

^fSome 30% of deaths attributed to suicide by suffocation may be due to autoerotic asphyxia (AEA), the practice of using strangulation to enhance the pleasure of masturbating. Most victims are young males, ages 13 to 20, although cases as young as 9 have been reported. The practice is underreported because parents or relatives often find the victim and alter the death scene; emergency medical technicians, emergency room technicians, and police investigators are not trained to recognize AEA; and there are societal pressures to misreport such an event as suicide. Additionally, in the state of Mississippi, county medical examiner investigators (elected officials) who are responsible for autopsies are not required to have completed medical training, although abbreviated death investigation training is required through the Mississippi State Medical Examiner's Office. Prevention strategies are aimed primarily at parents and schools or churches that serve as the site for comprehensive health education programs. As the Center for Parent/Youth Understanding explains, there is no list of obvious warning signs. Short of clear physical evidence of repetitive hanging such as marks on the neck, prevention strategies for AEA include parental and teacher involvement and training as well as prevention education for the child as part of a suicide prevention component of a comprehensive health education program.

Figure 9: Leading Causes of Death in Mississippi, Ages 1-4, 10 Year High, Low & Average, 1992-2001



Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

The leading causes of death are shown in more detail in Table 6.

Table 6: Leading Causes of Death, Ages 1-4, 1992-2001, Number of Deaths

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Avg.
Motor Vehicle Crashes	20	21	19	25	9	17	19	17	19	13	18
Fire/Burn	18	18	14	11	16	19	11	8	11	11	14
Congenital Anomalies	13	16	11	6	8	5	4	9	10	9	9
Drowning	10	6	5	8	5	6	6	8	12	14	8
Homicide	6	5	6	15	6	5	8	5	9	5	7
Heart Disease	5	4	7	7	0	6	3	1	1	6	4
Suffocation	3	5	8	2	1	2	3	5	5	5	4
Malignant Neoplasms	3	2	5	4	2	5	2	3	1	4	3
Influenza/Pneumonia	2	3	3	3	2	4	3	4	5	0	3
All Deaths 1-4	113	120	123	114	86	88	92	92	100	97	103

Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Ages 5 to 9

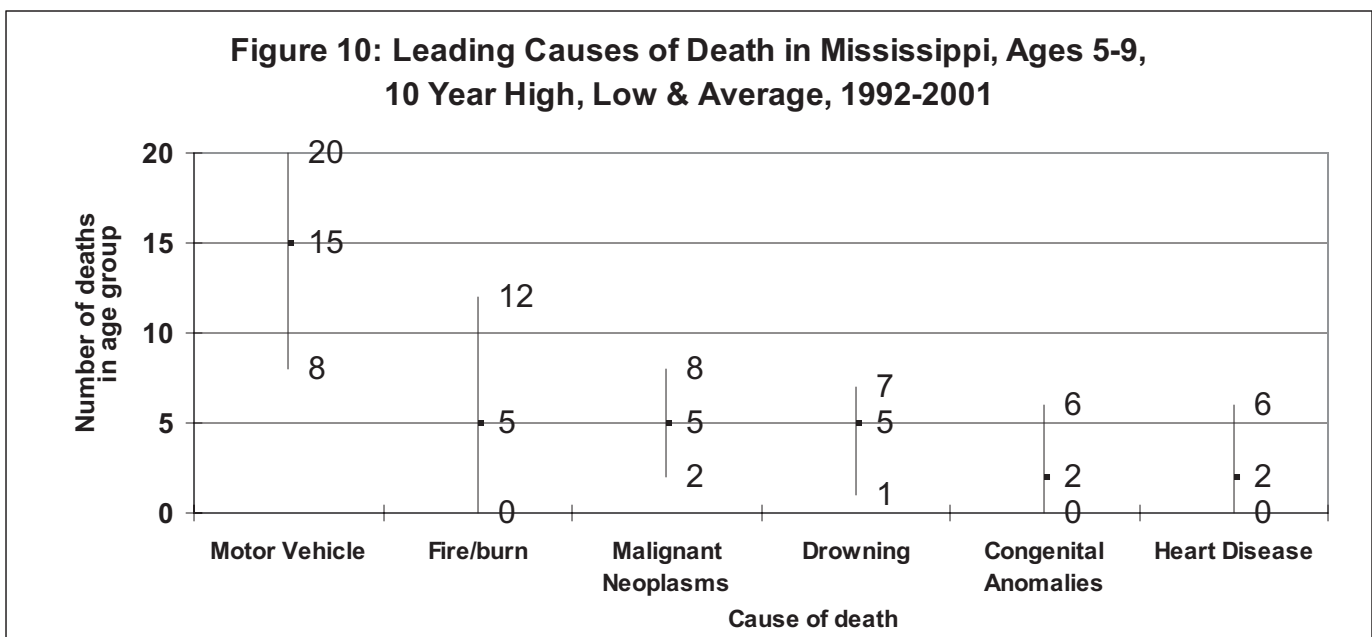
Figure 10 illustrates the ranges and averages of the leading causes of death in Mississippi among children ages 5 to 9 for a 10-year period. Motor vehicle crashes remained the number one cause of death. They accounted for an average of 15 deaths per year, out of an average yearly total of 56 deaths in this age category. Children in this age category face the same risks as toddlers if they are not adequately restrained in their child seat or the adult driver is engaged in risky behavior. A continuing issue is premature movement of a child from a child

restraint system to a seat belt and booster seat.⁶⁶ To be effective, the child restraint must be appropriate for the child’s weight. Children in this age category average from 41 lbs. (age 5) to 64 lbs. (age 9). Typically, young children (over 40 lbs.) should be restrained in a belt-positioning booster seat that is forward-facing, but still in the back seat of the motor vehicle.⁶⁷ Those under 40 lbs. should continue to be restrained in a convertible type of seat, facing forward in the rear seat. The NHTSA has initiated a national program to increase the use of booster seats among children ages 4 to 8.⁶⁸ Preliminary research suggests that booster seat usage among low-income groups can be increased through the provision of free booster seats and training in the use of booster seats.⁶⁹ Mississippi law allows children ages 8 and older or adults seated in the rear seat to legally ride without a child restraint or a seat belt.⁷⁰

Fire and burning deaths averaged five per year. At this age (5-9), a child is both inquisitive and mobile, making them more dangerous to themselves. However, without a detailed analysis of the circumstances of these deaths, it is impossible to determine if the children were actively engaged with fire (e.g., playing with matches) or a passive victim (e.g., died as a result of a house fire, lack of smoke alarms, etc.).

Drowning also had an average of five deaths per year. At this age, children have reached a developmental level sufficient to learn swimming strokes. Although no one can be “drown-proofed,” learning to swim is an important step to water survival.⁷¹ Nationally, males were at greater risk for drowning, accounting for 78% of drownings for all ages in 2001.⁷² Additionally, African American children ages 5 to 19 drown at a rate that is 2.6 times the rate of White children.⁷³ The advice of the American Academy of Pediatrics continues to be that “children should receive constant, close supervision by an adult while in and around the water.”⁷⁴

Across the 10-year period, trailing causes of death were malignant neoplasms, congenital anomalies, and heart disease. An average of 34 deaths per year is categorized as preventable in this age group; therefore, 11 lives of children could possibly be saved annually through targeted prevention programs.



Source: Calculations based on “20 Leading Causes of Death, 2001, All Races, Both Sexes,” and “20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes.” Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

The leading causes of death are shown in more detail in Table 7.

Table 7: Leading Causes of Death, Age 5-9, 1992-2001, Number of Deaths

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Avg.
Motor Vehicle Crashes	15	8	11	17	14	13	20	18	15	14	15
Fire/Burn	8	7	5	4	4	0	12	3	2	6	5
Drowning	1	7	3	5	5	5	6	5	5	5	5
Malignant Neoplasms	8	6	3	4	5	7	3	3	5	2	5
Congenital Anomalies	1	3	3	0	4	0	2	6	1	3	3
Heart Disease	1	5	2	2	5	0	6	1	1	1	2
Homicide	1	5	2	1	0	4	2	1	1	2	2
Suffocation	1	0	1	2	3	2	2	1	0	1	1
Other Transport	4	0	0	0	0	1	0	4	2	2	1
Influenza/Pneumonia	2	0	1	0	2	0	1	1	0	1	1
All Deaths 5-9	71	56	48	47	67	46	70	59	46	50	56

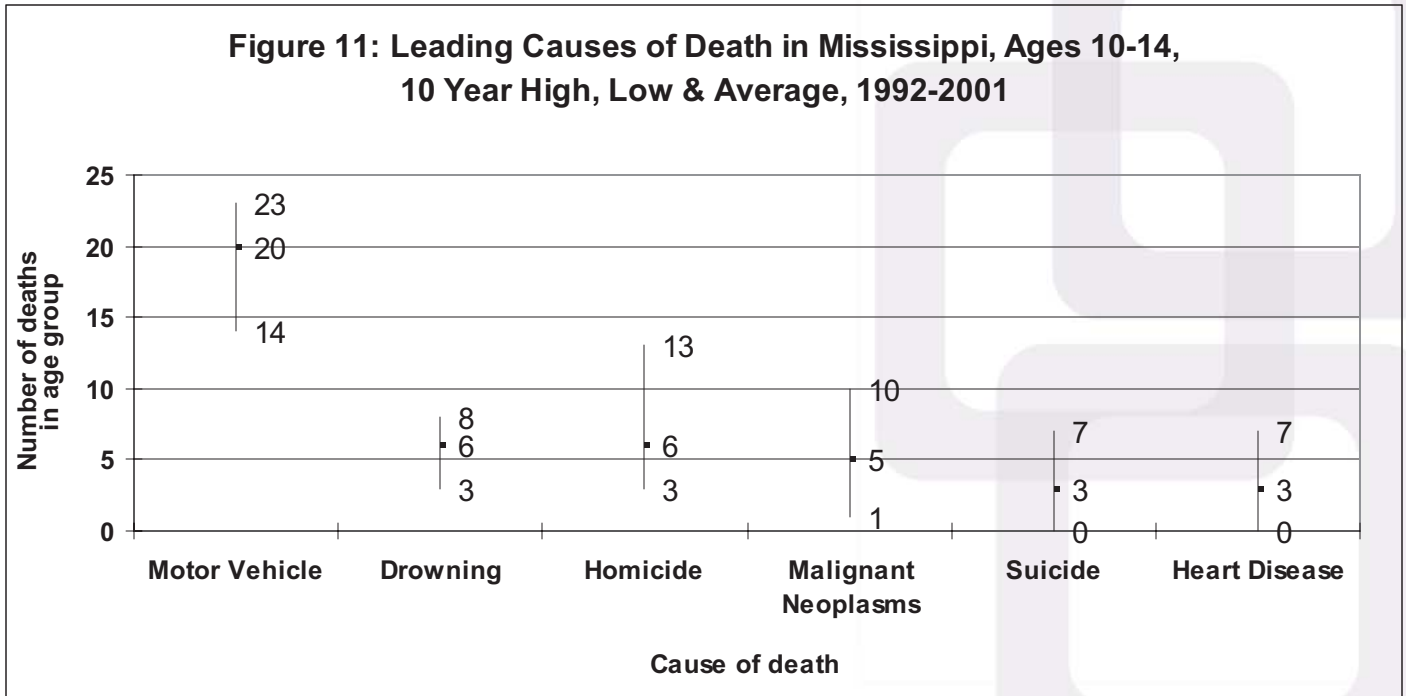
Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Ages 10 to 14

Figure 11 illustrates the ranges and averages of the leading causes of death in Mississippi among children ages 10 to 14 for a 10-year period. Motor vehicle crashes remained the number one cause of death, accounting for an average of 20 deaths per year, out of an average yearly total of 74 deaths in this age category. Adult lap and shoulder belt systems alone will not fit most children until they are at least 4 feet, 9 inches tall and weigh at least 80 pounds (usually between the ages of 8 and 12).^{75,76} Young children should be restrained in a belt-positioning booster seat that is forward-facing until they are large enough to graduate to an adult lap and shoulder harness, and they should sit in the back seat of the motor vehicle until age 13.⁷⁷ Children in this age category average from 68 lbs. (age 10) to 112 lbs. (age 14).

Drowning deaths averaged six per year. Children in this age category continue to grow in terms of water ability and independent access to water. Homicide accounted for between 3 and 13 deaths in a year and averaged 6 deaths across the decade. The American Academy of Pediatrics supports regulations on the manufacture, sale, purchase, ownership, and use of firearms, as well as a ban on handguns and semiautomatic assault weapons.⁷⁸ Nationally, homicide is the second leading cause of death among young people ages 10 to 24 and is the leading cause of death for African Americans.⁷⁹ Males are disproportionately at risk for homicide in the nation as a whole. In very broad terms, according to the World Health Organization, economic growth is seen as a means of reducing homicides at the societal level.⁸⁰ At the neighborhood level, one study showed that mortality risks were elevated in neighborhoods with high economic inequality or where 10% or more of the residents were Non-Hispanic African American or 20% or more of the households were headed by a single parent.⁸¹ Trailing causes of death in this age group were malignant neoplasms, suicide, and heart disease. An average of 48 deaths per

year is categorized as preventable in this age group; therefore, 16 lives of children could possibly be saved annually through targeted prevention programs.



Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

The leading causes of death are shown in more detail in Table 8.

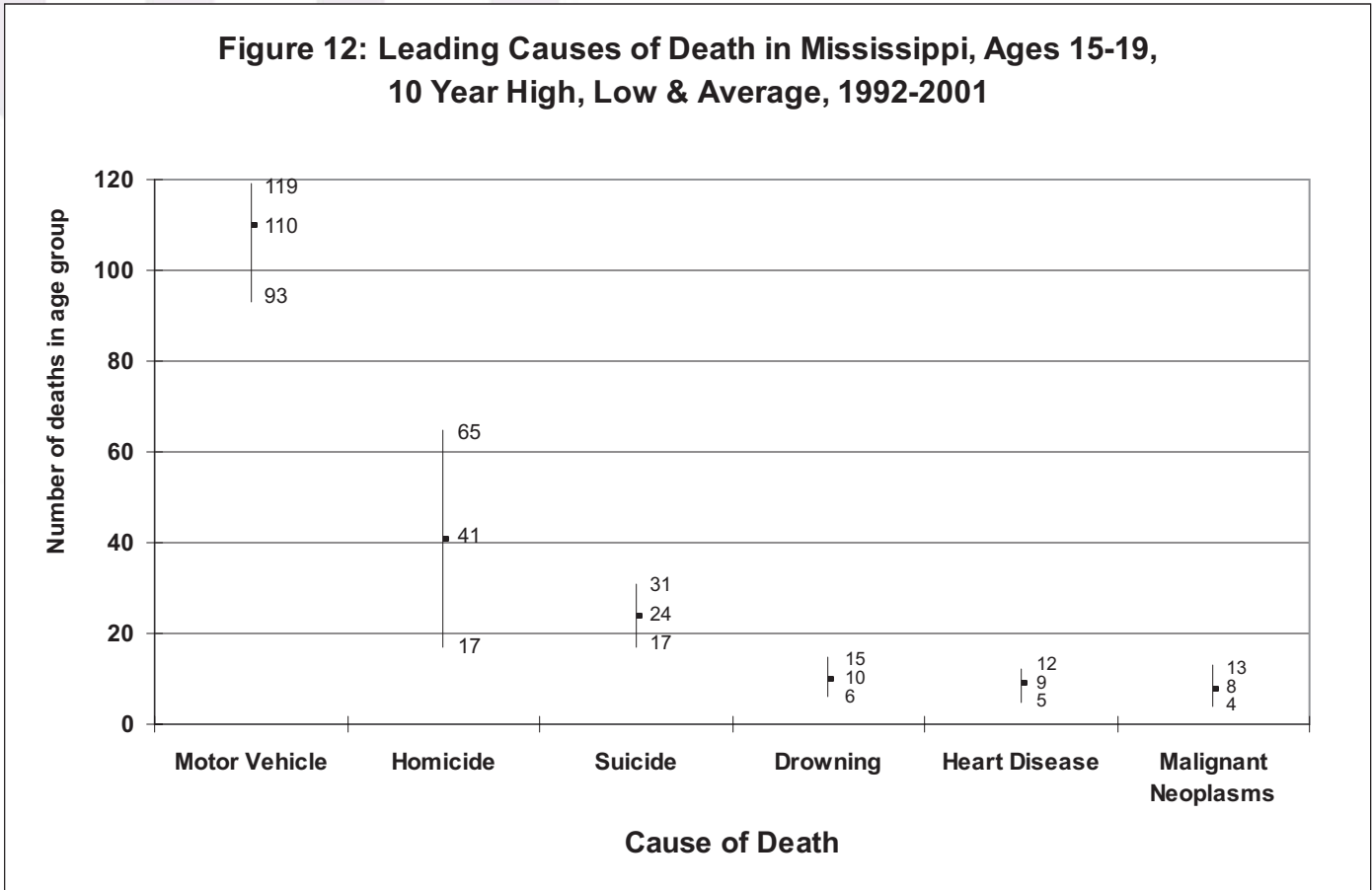
Table 8: Leading Causes of Death, Ages 10-14, 1992-2001, Number of Deaths

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Avg.
Motor Vehicle Crashes	23	14	20	20	20	19	23	22	18	17	20
Drowning	6	6	5	8	5	3	8	6	5	7	6
Homicide	3	9	4	13	7	3	6	5	4	4	6
Malignant Neoplasms	6	4	5	1	8	4	3	10	3	4	5
Suicide	2	4	2	5	4	5	7	0	2	3	3
Heart Disease	2	3	0	7	5	5	2	2	5	1	3
Fire/Burn	2	4	3	3	1	4	2	6	2	2	3
Congenital Anomalies	0	3	4	3	7	2	3	0	2	0	2
Other Transport	2	2	3	1	2	1	1	4	0	4	2
Suffocation	3	1	1	1	0	1	2	2	2	0	1
Influenza/Pneumonia	0	1	1	0	2	3	1	1	1	2	1
All Deaths 10-14	71	65	70	85	82	74	81	79	73	60	74

Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

Ages 15 to 19

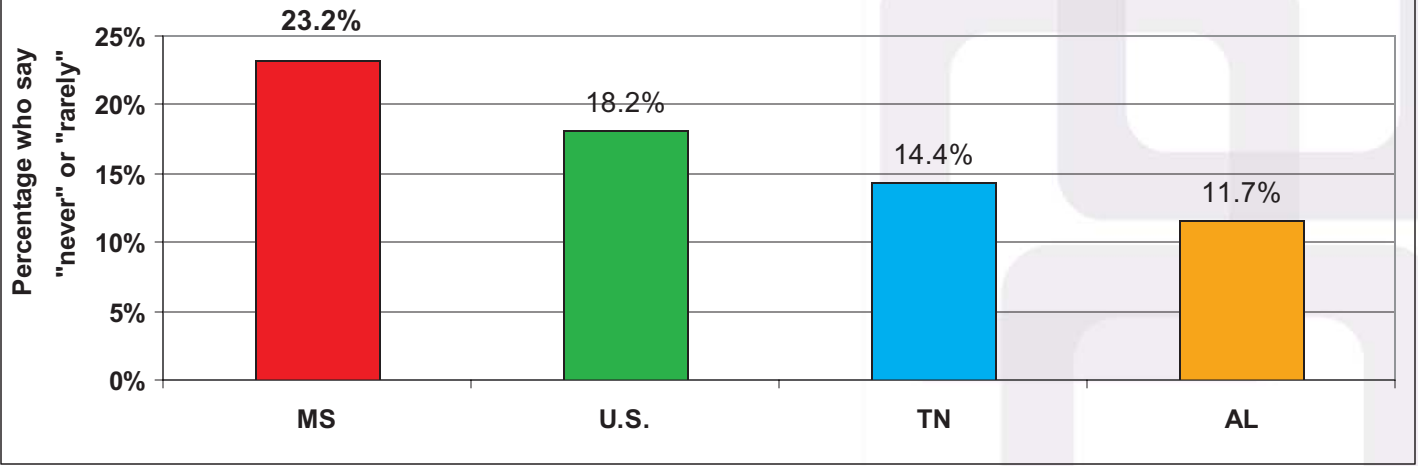
Figure 12 illustrates the ranges and averages of the leading causes of death in Mississippi among children ages 15 to 19 for a 10-year period. Motor vehicle crashes remained the number one cause of death, accounting for an average of 110 deaths per year, out of an average yearly total of 254 deaths in this age category. This is a preventable cause of death that continues to be a prime target for intervention and prevention strategies.



Source: Calculations based on “20 Leading Causes of Death, 2001, All Races, Both Sexes,” and “20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes.” Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

The CDC conducts a nationwide survey of high school students (grades 9-12), the Youth Risk Behavior Surveillance System, which measures risky behaviors.⁸² Questions are asked concerning: seat belt usage, riding with someone who has been drinking, and driving after drinking. The next three graphs compare Mississippi high school students’ most recent responses with those of the nation and surrounding states. (Results for Louisiana and Arkansas were not available for 2003.) Almost one-quarter (23.2%) of Mississippi high school students claimed that they “never” or “rarely” wear a seat belt when riding in a car driven by someone else. This was almost twice the level of the neighboring state of Alabama. The differences between Mississippi and the states of Tennessee and Alabama were statistically significant, while the differences between Mississippi and the U.S. were not statistically different.

Figure 13: Percentage of High School Students Who "Never" or "Rarely" Wear a Seat Belt: Mississippi Compared to the U.S. and Surrounding States, 2003



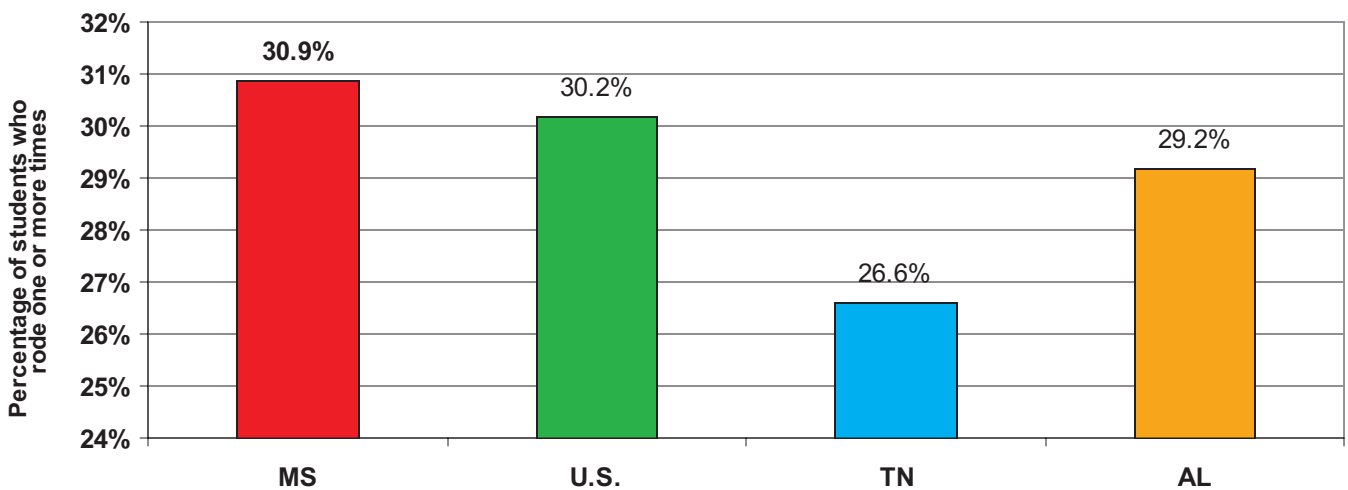
Source: Centers for Disease Control. 2004. Youth Risk Behavior Surveillance System. Available at:

<http://www.cdc.gov/HealthyYouth/yrbs/>

The 95% confidence intervals for the above states were: +/- 2.7% (MS), +/- 4.2% (U.S.), +/- 3.6% (TN) and +/- 2.1% (AL).

Almost a third (30.9%) of Mississippi high school students claimed that within the past 30 days they rode at least once in a vehicle driven by someone who had been drinking alcohol. This was slightly higher than the national average (30.2%) or the average of surrounding states, although the difference was not statistically significant.

Figure 14: Percentage of High School Students Who Rode in a Vehicle Driven by Someone Who Had Been Drinking: Mississippi Compared to the U.S. and Surrounding States, 2003

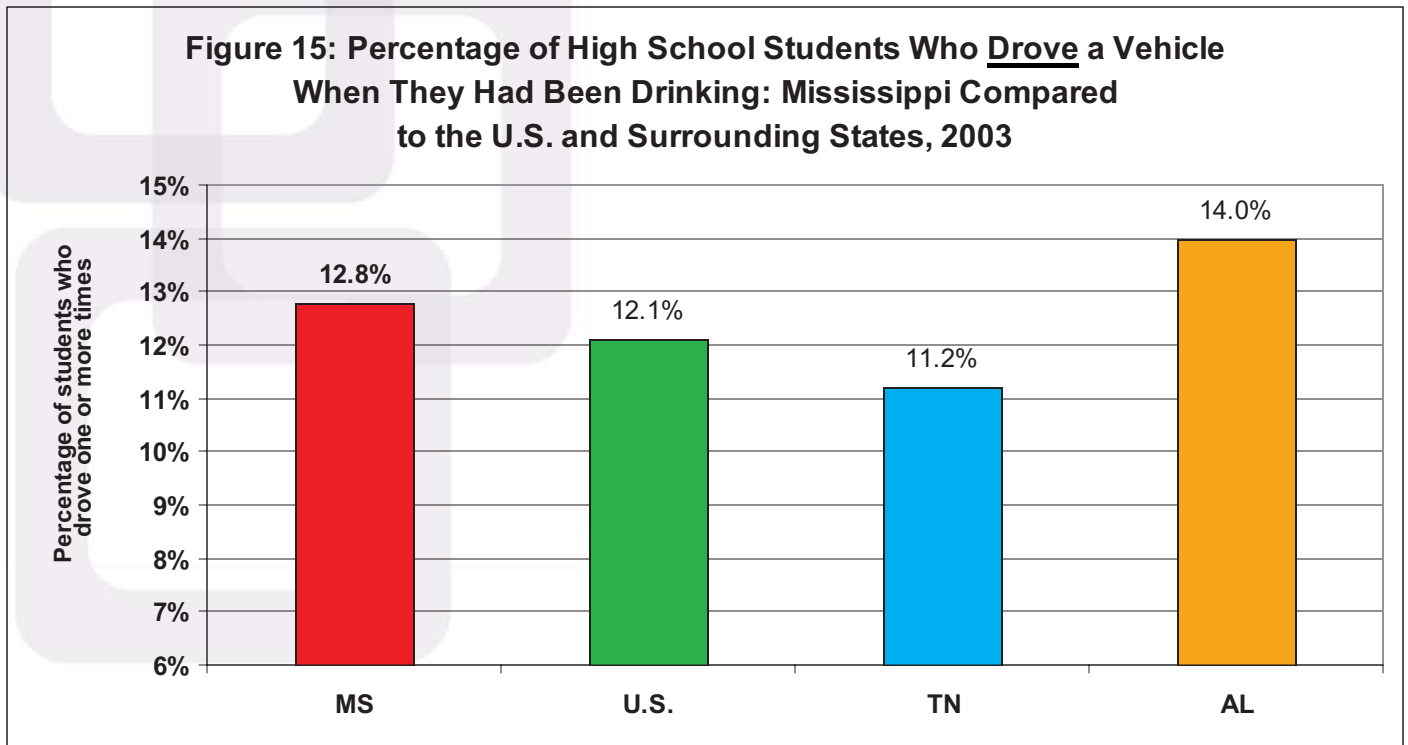


Source: Centers for Disease Control. 2004. Youth Risk Behavior Surveillance System. Available at:

<http://www.cdc.gov/HealthyYouth/yrbs/>

The 95% confidence intervals for the above states were: +/- 2.8% (MS), +/- 1.2% (U.S.), +/- 2.9% (TN), and +/- 3.4% (AL).

Of the alcohol-related deaths to child passengers, 35.3% involved a male driver under the age of 21. Another 17.6% of alcohol-related deaths involved female drivers under the age of 21. A Journal of the American Medical Association study also found that, in the case of older children, it was likely that the impaired driver was a social peer (rather than an adult relative).



Source: Centers for Disease Control. 2004. Youth Risk Behavior Surveillance System. Available at: <http://www.cdc.gov/HealthyYouth/yrbs/>

The 95% confidence intervals for the above states were: +/- 2.7% (MS), +/- 2.1% (U.S.), +/- 3.0 (TN), and +/- 2.1% (AL).

Finally, almost one in six Mississippi high school students (12.8%) admitted that during the past 30 days they drove a vehicle one or more times when they had been drinking alcohol. This was close to the national average of 12.1% and slightly less than the percentage of Alabama high school students, although the differences were not statistically significant.

Homicide was the second leading cause of death for this age group, accounting for between 17 and 65 deaths per year, a decade average of 41 deaths per year. Suicide was the third leading cause of death, accounting for an average of 24 deaths. Across the 10-year period, trailing causes of death were drowning, heart disease, and malignant neoplasms. An average of 205 deaths per year is categorized as preventable in this age group; therefore, 68 lives of children could possibly be saved annually through targeted prevention programs.

The leading causes of death are shown in more detail in Table 9.

Table 9: Leading Causes of Death, Ages 15-19, 1992-2001, Number of Deaths

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Avg.
Motor Vehicle Crashes	108	119	116	110	118	111	102	108	110	93	110
Homicide	51	53	65	42	41	43	23	39	36	17	41
Suicide	26	31	25	27	17	28	21	21	25	19	24
Drowning	8	7	11	11	15	7	13	6	8	10	10
Heart Disease	12	7	8	6	11	7	9	9	11	5	9
Malignant Neoplasms	7	5	7	12	12	13	11	4	5	4	8
Congenital Anomalies	1	3	3	4	3	2	4	1	2	4	3
Fire/Burn	1	3	3	2	8	3	4	4	1	1	3
Other Transport	2	3	1	2	2	1	1	1	7	5	3
Influenza/Pneumonia	1	3	2	1	1	3	0	2	1	1	2
Suffocation	1	0	1	1	2	3	0	0	1	1	1
All Deaths 15-19	261	269	280	273	272	268	232	245	241	200	254

Source: Calculations based on "20 Leading Causes of Death, 2001, All Races, Both Sexes," and "20 Leading Causes of Injury Deaths, 2001, All Races, Both Sexes." Centers for Disease Control. Available at: <http://www.cdc.gov/ncipc/wisqars/>

PREVENTION STRATEGIES

One possible means for determining injury-prevention solutions could involve the use of a Haddon Injury Matrix combined with public health interventions.⁸³ The Haddon Injury Matrix is a three-by-three matrix that examines the three factors of host, agent, and environment against three factors of time (pre-event, event, and post-event).⁸⁴ The Haddon Matrix was initially proposed as a means of analyzing factors in a motor vehicle crash. The tiered public health approach is a four-step intervention, beginning with surveillance, then definition of risk factors, evaluation of what intervention would accomplish, and finally, full program implementation.⁸⁵ As Lett et al. argue, by merging the two systematic approaches, both the factors that cause injuries as well as the public health interventions that are designed to prevent these injuries could be examined in relation to each other. Such a coherent and comprehensive framework could assist in more completely understanding the causes and consequences of injuries.

Infant Health

From a public health perspective, some negative health outcomes for infants are preventable through well-recognized interventions. These include increased and equitable access to prenatal care, the reduction of teen pregnancy, increased health literacy, and the associated reduction of poverty and health care inequality. Two programs managed by the Mississippi State Department of Health (MSDH) are designed to reduce low birthweight as well as infant and maternity mortality and morbidity, as described on the MSDH Web site at <http://www.msdh.state.ms.us/msdhsite/index.cfm/32,0,225,168.html>. Discussed programs are as follows:

Perinatal High Risk Management Infant Service System (PHRM)

“As a Medicaid provider, MSDH provides a perinatal high risk case management program. This program includes a multidisciplinary range of preventive health services for pregnant women including physical exams, nutrition, social services, health screening, education, counseling, interventions, and referral services, as appropriate. The primary objective of the MSDH perinatal health care program is to decrease infant mortality and low-birth-weight infants by providing health care to pregnant women. By increasing the number of women having access to prenatal care, it is intended to assist with the reduction of infant mortality.”

Pregnancy Risk Assessment Monitoring Survey (PRAMS)

“The Pregnancy Risk Assessment Monitoring Survey (PRAMS) is a joint project between the Mississippi State Department of Health and the CDC. The purpose is to find out why some babies are born healthy and others are not. To do this, the survey asks new mothers questions about their pregnancies. The answers are confidential and provide information about ways to improve the chances for mothers and babies in Mississippi.” The PRAMS results can be compared to the Healthy People 2010 objectives for maternal and child health, the national health goals that have been set by the U.S. Department of Health and Human Services.

Furthermore, all newborns in the state are screened for 40 possible genetic disorders.^{89,90,91} Mississippi is 1 of 21 states that screens for the March of Dimes recommended list of metabolic disorders.⁹²

Vaccinations are a well known mechanism for the prevention of childhood illnesses and disabilities. Their importance is reflected in the adoption of a national health objective for vaccinations. The Healthy People 2010 goal is to sustain a vaccination coverage of 95% or higher among children entering kindergarten and first grade.⁹³ For the 2003-04 school year, 100% of children in Mississippi were surveyed. For all vaccinations, coverage of Mississippi school children was 99.8%, the highest reported vaccination rate in the nation.⁹⁴ The vaccinations surveyed were for polio, diphtheria-tetanus toxoids-pertussis, measles, mumps, rubella, hepatitis B, and varicella.

Drowning

Any prevention strategy must be driven by the specific causes of drowning in Mississippi. As noted, different environmental conditions (e.g., pool versus bath tub) will demand different prevention programs. The drowning data collected by the CDC does not detail the specific cause or conditions of the drowning. Thus, a detailed analysis of hospitalization and police records would be appropriate before developing a toddler drowning prevention program in Mississippi.⁹

⁹ Individual death certificates can be obtained for these drowning deaths; however, it would not list the environment or circumstances of the death. Nor would it cover near-drowning events. Hospitalization records would include both near-drowning and death events; however, they likely would not include the circumstances leading to the hospitalization. Likewise, police records might not address the circumstances and would not be filed for every incident (both near-drowning and death).

Generally, as a means of prevention, infant and toddler swimming and water survival skill programs are popular. However, even programs that emphasize water survival skills do not significantly increase the safety skills of young children.⁹⁵ The American Academy of Pediatrics (AAP) found that “children are generally not developmentally ready for formal swimming lessons until after their fourth birthday (AAP, 2000, p. 869).”⁹⁶ The report further noted that premature (relative to the developmental age of the child) training programs may reduce the child’s fear of water without providing the necessary survival skills. In a subsequent policy statement about the prevention of drowning, the AAP focused on actions to be taken by the caregiver.⁹⁷ The policy statement emphasized that caregivers must exercise “touch supervision” (within an arm’s length of the child at all times when around water). The companion technical report recognized that there are lapses in such supervision and, thus, layers of physical barrier protection are necessary.⁹⁸ Suggested prevention strategies could include direct supervision and the presence of lifeguards, training in CPR, the availability of proper safety equipment, four-side fencing of pools, use of pool alarms and covers, and the use of personal flotation devices. In terms of public health and public policy, the policy statement contained several recommendations: legislation to mandate fencing around all pools, public pools with lifeguards who have current CPR training, mandates for lifeguards at natural swimming areas and private recreational facilities, the prohibition of alcohol by water craft operators, improvements in the emergency medical service, and improvements in the documentation of immersion events.⁹⁹

In Mississippi, there are no statewide standards for building codes.¹⁰⁰ Each county adopts their own set of building codes. However, insurance companies who underwrite homeowner’s property and liability insurance have individually adopted guidelines for insuring residences with swimming pools. Generally, they require a fence and latching gate around an in-ground pool (while excluding diving board from liability coverage) and no special requirements for an above-ground pool.¹⁰¹ In lieu of building codes that specifically address the issue, homeowner insurance requirements regulate residential pools in Mississippi.^h

Motor Vehicle Deaths

Clearly, if more drivers properly restrained their children, fewer children would die in motor vehicle crashes. In addition to increased personal responsibility, there are two pieces of state legislation that could increase the rate of child restraint use in motor vehicles: a primary seat belt law and a DUI child endangerment law.

Mississippi currently has *secondary enforcement* of seat belt laws. Unlike primary enforcement, which allows police to stop a vehicle solely for a seat belt violation, secondary enforcement requires police to stop a vehicle for some other traffic offense before they can write a ticket for seat belt or child restraint violations. Based on the experience of other states, changing Mississippi’s law from secondary to primary enforcement could result in improved seat belt and child restraint use, and lives might be saved. A recent study of nine states before

^h When approaching potential prevention program it should be noted that state laws are not the only means of regulation. The “market place” represented in this instance by insurance companies writing homeowner insurance policies, can also effectively regulate individual behavior. The same principle is applicable insuring motor vehicles.

and after a primary seat belt law was put in place, conducted by the Insurance Institute for Highway Safety, showed a 7% drop in motor vehicle deaths attributed to the new law.¹⁰² Public opinion surveys show that most (70% in 2002) Mississippi drivers already support a primary enforcement seat belt law.¹⁰³

Survival rates among seat belt users in an accident are higher than non-seat belt users (45% to 60% effective in preventing deaths and 50% to 65% effective in preventing moderate to critical injuries^{104,105}). Researchers at the CDC found that states that moved from secondary to primary enforcement safety belt laws saw an average increase of 14% in seat belt use.¹⁰⁶ Additionally, the use of child seats and restraints increases survival rates among children (55%-70% effective in preventing deaths). Thus, with more vehicle occupants using seat belts, more individuals will survive motor vehicle crashes. This has implications for the survival of children since belted parents lead to buckled children nearly all the time (94%). When drivers are unbelted, children are buckled up only 30% of the time.¹⁰⁷ In a CDC review, there were five studies showing that “observed” safety belt use increased by 14%, two studies showing that “self-reported” safety belt usage increased by 1% to 22%, and three studies showing that fatal injuries dropped by 8% in the states in which primary enforcement was the law.¹⁰⁸ Interestingly, driving characteristics (e.g., age, miles traveled, types of roads in the state, etc.) were unrelated to seat belt usage, but a primary seat belt law was consistently correlated with higher seat belt usage.¹⁰⁹

A related safety issue is the proper use of child restraint systems. In a 2004 multi-state study of child restraint systems by Decina and Lococo, critical misuseⁱ was observed in 72.6% of the cases.¹¹⁰ The most common critical misuses were loose harness straps securing the child to the child restraint system and loose vehicle safety belt attachment around the child restraint system. As one means of addressing this issue, effective fall 2002, all vehicles were required to have the Lower Anchors and Tethers for Children (LATCH) system in place. The report went on to recognize the complexity of child restraint systems and the continuing need to modify them for children as they age and grow. This finding confirmed an earlier (June 2003) review of the LATCH system by the Insurance Institute for Highway Safety. After analyzing the LATCH system in 50 new vehicles, the researchers concluded that “installation generally was easier and less complex with LATCH-compliant systems.... Still, LATCH doesn’t always make it a simple click-in operation to install a restraint.”¹¹¹ A study by Block (2002) found that 74% of parents used only the printed instructions by the manufacturer to install their child restraint system.¹¹² The 2004 report by Decina and Lococo recommended that child restraint observations and driver intervention/training be made more common in states, the child restraint field observers be course-certified in proper child restraint operation, and increased education be directed toward both parents/caregivers as well as law enforcement officials.

The body of motor vehicle crash research suggests that the lives of some adults and children could be saved if Mississippi moved to primary enforcement of seat belt laws. However, Mississippi’s laws regarding enforcement do not cover passengers in all seating locations.¹¹³ The law requires that children ages 3 years and younger be placed in a child restraint. Seat belts are required for those ages 4 through 7 in all seats and age 8 and older in

ⁱ Critical misuse is any form of misuse that could be expected to increase the risk of injury to the child.

the front seat only. Thus, preteens and older children may legally ride in the back seat without a child restraint or seat belt. Additionally, anyone may ride unrestrained in the open bed of a truck. Safety groups have issued calls for such gaps in safety restraint legislation to be closed.^{114,115}

A second form of legislation is a DUI child endangerment law. In recent years, alcohol was involved in 41% of all traffic fatalities nationwide,¹¹⁶ and almost 25% of all deaths to child passengers (ages 0-14) involved alcohol use.¹¹⁷ During 2001 and 2002 in Mississippi, a total of 51 young people (ages 0-20) were passengers riding with a legally impaired driver involved in a fatal crash. This was 23% of all passengers in this type of crash. In other words, one-quarter of the passengers involved in a fatal car crash with a drunk driver were children.¹¹⁸ Of those 51 young passengers, 30 were severely injured or killed in the crash. To provide a sense of the number of children at risk, in any given month, an estimated 29,752 drunk drivers may be behind the wheel in Mississippi, though it is not known how many may have been transporting minors.^k

Alcohol represents a double threat to child passengers. Adult drunk drivers were more likely to be involved in a fatal crash, and they were less likely to restrain their children.^{119,120} Although seat belts are an effective way to reduce accidents and injuries, adults who do not wear their seat belts are less likely to restrain their children.¹²¹ In addition, a study by Voas, Fisher, and Tippetts found that when drivers had been drinking, children were about half as likely to be restrained in the vehicle.¹²² Furthermore, a study published in the Journal of the American Medical Association documented that child restraint use decreased as the blood alcohol concentration of the driver increased. The researchers concluded that the majority of drinking-driver-related child passenger deaths in the United States involved a child riding unrestrained in the same vehicle.¹²³

Mississippi has several laws designed to reduce drunk driving. However, it is 1 of 15 states that does not have a child endangerment law (penalties for driving under the influence with a minor in the vehicle^l).^{124,125,126} Of the surrounding states, Alabama, Louisiana, and Tennessee have DUI child endangerment laws in place.

Among children, the 15 to 19 age group is at highest risk for death due to motor vehicle crashes. Recognized causes are driver inexperience, alcohol, aggressive driving and risk taking, and distractions. The National Committee on Uniform Traffic Laws and Ordinances (NCUTLO) has developed a model graduated-licensing law.¹²⁷ The core components are a learner's phase of at least 6 months, an intermediate license phase of at least 6 months that includes a prohibition against unsupervised nighttime driving, and full licensure.

^j The calculated 51 underestimates the actual number of fatal accidents involving alcohol and a child in the vehicle. These calculations are based only on crashes that have been entered into the Fatal Accident Reporting System with a reported Blood Alcohol Concentration (BAC). Crashes with missing BAC were not included in these calculations, which were provided by the Mississippi Office of Highway Safety. In contrast, it is common practice for the National Highway Transportation Safety Administration to estimate alcohol involvement for crashes that have unreported BAC. Thus, National Highway Transportation Safety Administration estimates of alcohol involvement in motor vehicle crashes are higher than the state calculations presented here.

^k In the December 2003 "Drink, Drive, Lose" telephone survey of Mississippi drivers, 1.6% admitted to having too much to drink and then driving in the last month, while 3.2% said they had a drink prior to driving. Given that Mississippi had 1,859,487 licensed drivers (2001), 1.6% yields an estimated 29,752 impaired drivers in a given month. Furthermore, this estimate is low because it does not take into account non-Mississippi driver DUI arrests, which comprise 23% of all DUI arrests (2001).

^l All states have basic child endangerment laws that create separate offenses or enhanced penalties for endangering a minor. The DUI child endangerment law creates special sanctions for individuals who are DUI/DWI while transporting a child. These sanctions take the following three forms: enhanced penalties, charges for separate offenses, and aggravating circumstances.

Additionally, the driver must remain free of traffic violations during the license phases.¹²⁸ Mississippi's law contains both a learner stage with a mandatory holding period of at least 6 months and an intermediate stage with a nighttime driving restriction.¹²⁹ Additional prevention strategies include zero-tolerance alcohol laws, minimum supervised-driving practice requirements, passenger restrictions (i.e., restricting the number of teenaged passengers with a teenaged driver), and increased parental supervision and intervention.

Fire

Most state building codes require functional smoke alarms to be used in both new and existing dwellings. The National Fire Protection Association (NFPA) recommends that at least one smoke alarm be installed on every floor of every building and in every sleeping area.¹³⁰ Mississippi's fire prevention code for residential construction requires smoke alarms in all sleeping areas, in the immediate vicinity outside of each separate sleeping area, and on each level of the dwelling including the basement.¹³¹ Many localities also require that smoke alarms be powered by the building's electrical system, rather than relying on batteries as the sole source of power. Some localities have ordinances mandating automatic sprinkler systems in new residential buildings.¹³² In Mississippi, buildings over 75 feet in height, both new construction as well as existing construction with more than 25% renovated, must be equipped with a totally automatic sprinkler system.¹³³

The NFPA recommends the following individual actions: smoke alarms should be tested monthly, new batteries should be installed once a year, and smoke alarms should be replaced every 10 years. In 2001 Mississippi was 1 of 13 states awarded a 5-year cooperative agreement with the CDC to undertake a fire prevention program. Actions included installing longer-lasting, lithium-powered smoke alarms and providing fire safety education in high risk communities.¹³⁴ The National SAFE KIDS Campaign also recommends that flammable materials and matches/lighters be locked away from children's reach and burning candles not be left unattended and be kept in a safe location away from children and pets.¹³⁵

In related safety legislation, the U.S. Consumer Product Safety Commission in 1994 issued a mandatory safety standard requiring that disposable cigarette lighters be equipped with child-resistant mechanisms. Since that time, the number of fires resulting from children playing with lighters has declined by 58%.¹³⁶

Homicide and Suicide

Restrictions on the possession of firearms would be one strategy of reducing both homicide and suicide deaths. Research has shown that where firearm ownership rates were high, homicide rates by firearm were high.¹³⁷ Prevention strategies aimed at firearms are well known: keep firearms out of the home and/or out of the reach of young people, or keep both the firearm and ammunition locked in separate locations.¹³⁸ As mentioned earlier, Mississippi does not have any child access prevention (CAP) legislation in place. A comprehensive review by Princeton University's Woodrow Wilson School of Public and International Affairs and The Brookings Institute recommended a wide range of approaches to firearm-related youth violence, including the reduction of

unsupervised exposure to weapons, addition of product safety features on guns (similar to features on childproof medical packages and car safety devices), safe storage of weapons in the home, strengthening of social norms against violence, control of youth's access to violent media, and addition of legislation and enforcement to curb illegal gun sales to youth.¹³⁹ Furthermore, given that half of youth homicides are committed by young people, the recommended strategies include a combination of graduated sanctions; targeted and compassionate policing; and prevention programs in the schools, home, and other social institutions.¹⁴⁰ Another study focusing on the reduction of juvenile violence recommended a different set of programs: mentoring, after-school recreational programs, family therapy for delinquent youth, and parent education programs.¹⁴¹ Additionally, to address youth suicide, comprehensive suicide prevention education in schools by trained instructors was recommended.¹⁴²

CONCLUSION

An estimated 121 deaths per year to Mississippi children are preventable via targeted intervention and prevention strategies to the family, community, and state (through laws, regulations, and public health programs). Mortality data can be used to formulate injury-based prevention programs. "Successful injury prevention programs have either modified behavior (e.g., the wearing of seat belts and helmets), addressed problems associated with hazardous agents (e.g., automobiles, flammable children's nightwear, packaging for drugs, and home-care products), or addressed environmental hazards (e.g., bridge abutments, road surfaces and shoulders, and access to residential pools). The most effective interventions have focused on passive protection, which is accomplished by changing agents and environments. Passive protection reduces the likelihood of injury, regardless of the behavior of those involved in an injury-related incident (CDC, 1997, p. 8)." The American Academy of Pediatrics recommends that child health research take into account factors such as race, ethnicity, gender, and socioeconomic status as possible mediators for health.¹⁴³

STATE RANKINGS

Mississippi's rank compared to other states, or Mississippi's portrayal in "snapshots," is one of many measures of our children's health.^m In addition to the statistics collected and produced by governmental agencies, private foundations fund programs that synthesize these data into a coherent picture. Nonetheless, ranking based on public health indicators still has its critics.¹⁴⁴

The Annie E. Casey Foundation has produced the *KIDS COUNT Data Book* since 1990.¹⁴⁵ The state rankings of child well-being are based on 10 measures of child health and welfare. Since the first edition was published in 1990, Mississippi has ranked last among the states; that is, this state is the least healthy for children. Table 10 provides a summary of the measures and Mississippi's ranking.

^m Caution must be exercised when viewing rankings. Most rankings are based on a computed numerical score, which is in the form of an interval number. When this number is transformed into an ordinal ranking (e.g., 1 to 50), the size of the interval between numbers is lost. For example, the numerical distance between 48th and 49th may have been much less than the distance between 49th and 50th. Yet, this nuance of relative position is suppressed in a simple ordinal ranking.

Table 10: KIDS COUNT Ranking of Mississippi, 2004 Edition

MEASURE	RATE	RANK
Percentage of low -birth-weight babies	10.7	50
Infant mortality rate (deaths per 1,000 live births)	10.5	49
Child death rate (deaths per 100,000 children, ages 1-14)	34	50
Rate of teen deaths by accident, homicide, and suicide (deaths per 100,000 teens, ages 15-19)	69	43
Teen birth rate (births per 1,000 females, ages 15-17)	39	49*
Percentage of teens who are high school dropouts (ages 16-19)	11%	35
Percentage of teens not in school or working (ages 16-19)	12%	48**
Percentage of children living in families where no parent has full-time, year-round employment	31%	47
Percentage of children in poverty	25%	49
Percentage of families with children headed by a single parent	35%	48
Overall state ranking		50

Note: All data are 2001.

*Tied with Texas.

**Tied with Louisiana.

Source: Annie E. Casey Foundation. 2004. Kids Count Data Book: State Profiles of Child Well-Being. Baltimore, MD.

Available at: <http://www.aecf.org/kidscount/>

Another health ranking system came to a similar conclusion about Mississippi's overall health. The *America's Health: State Health Rankings* report has ranked Mississippi among the bottom three states since it began profiling in 1990, and ranked Mississippi 49th in its 2004 edition.¹⁴⁶

Table 11: America's Health: State Health Rankings, Selected Measures

MEASURES	RATE	RANK
<i>Risk factors (3 of 9 shown)</i>		
High school graduation (percentage of incoming 9th graders)	59.1%	45
Children in poverty (percentage age 18 and under)	23.1%	44
Adequacy of prenatal care (percentage of pregnant women)	77.8%	21
<i>Risk ranking</i>		49
<i>Outcome factors (1 of 8 shown)</i>		
Infant mortality (deaths per 1,000 life births)	10.2	50
<i>Outcome ranking</i>		50
Overall state outcome ranking (all factors)		49

Source: America's Health: State Health Rankings. 2004. Produced by the United Health Foundation, the American Public Health Association, and the Partnership for Prevention. Available at: <http://www.unitedhealthfoundation.org/shr2004/>

In terms of a snapshot comparison of Mississippi to other states, our state consistently ranks last. This may reflect that Mississippi started last in the ranking and simply has not improved at a faster rate than other states in the nation. That notion could be answered in a time series analysis of the rankings. Nonetheless, the opportunities for health outcome improvement are numerous.

LIMITATIONS OF THIS RESEARCH

Several caveats are in order, so the users of the current work will understand its limitations. First, the link between cause and effect can be ill-defined, especially in the area of health. While the overt purpose of this paper is to highlight leading causes of death and injury that might be prevented, deaths due to medical conditions and diseases with significant lags or multiple dimensions (e.g., obesity, smoking, allergies, stress, and poverty) are not addressed. Thus, this paper intentionally focuses on immediate and fairly simple to define causes of death.

Second, this study does not thoroughly explore the following issues that would be necessary to address in order to develop effective intervention and prevention strategies:

- The differences in child mortality between rural and urban locations
- The differences in child mortality between races and genders
- The differences in child mortality associated with medical access
- The differences in child mortality associated with the quality of medical care received
- Injuries not resulting in death

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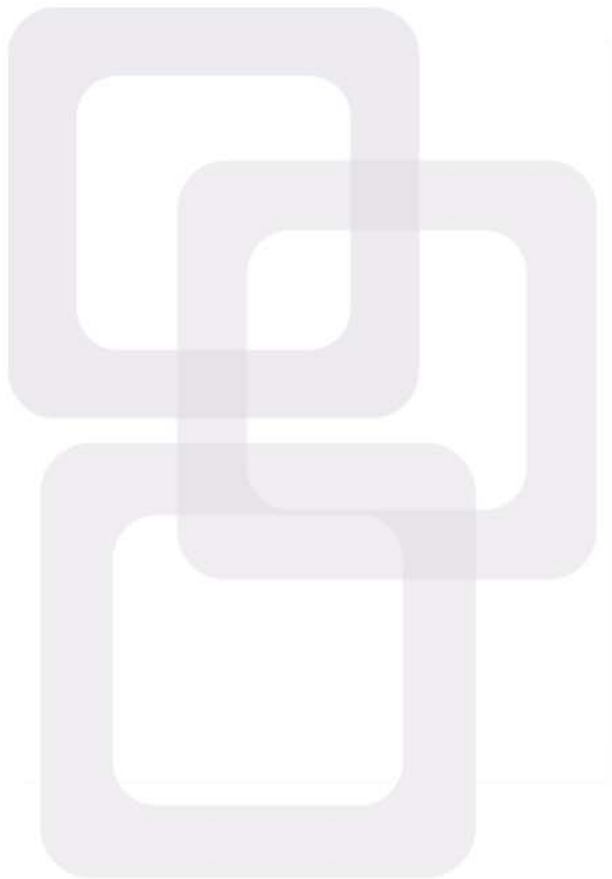
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