

# Residential Fire

## MAGNITUDE OF THE PROBLEM

### National

Fire and burn injuries were the sixth leading cause of unintentional injury death in the United States from 1996 to 1998, accounting for more than 3,500 deaths per year.<sup>1-2</sup> This rate is down from the early 1990's, when fire and burn injuries accounted for over 4,000 deaths each year and ranked as the fifth leading cause of unintentional injury death in the United States.<sup>2</sup>

Data collected on fire and burn injuries have shown that they follow certain risk patterns. Children under the age of 5 are at high risk for fire and burn injuries, because their development is incomplete, and therefore, they may not have the capacity to judge dangerous situations.<sup>3-5</sup> Persons aged 65 and older are also at higher risk for fire and burn injuries, because they are more susceptible to smoke inhalation and burns, and are less likely to recover from their injuries. Mobility and sensory impairments also add to an increase in risk for fire and burn injuries among older persons.<sup>3, 5</sup>

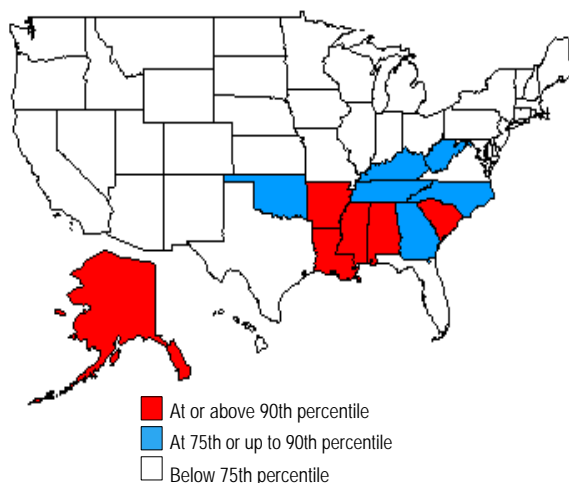
In 2000, residential house fires accounted for more than 79% of all fire deaths in the United States.<sup>5-6</sup> Approximately 379,500 residential fires killed about 3,420 people and injured another 17,400 people in the United

States in 2000,<sup>6</sup> resulting in someone killed or injured by a house fire every 27 minutes.<sup>5</sup> House fires result in approximately \$5 billion of property damage each year.<sup>5-6</sup> For every \$1 spent on smoke alarms, \$69 can be saved on fire-related costs.<sup>5</sup>

Residential house fire and burn injury death rates are highest in southern portions of the United States and Alaska. These areas have rates that are almost two times higher than the U.S. rates (Figure 1).<sup>1,6</sup>

African Americans and Native Americans are at higher risk for fire-related deaths than any other race or ethnicity. These disparities may be due to lower education levels, higher poverty levels, living in rural settings and higher percentages of persons living in manufactured housing.<sup>5</sup>

Figure 1. Residential Fire and Burn Injury Rates by State



## Oklahoma

In Oklahoma, 6,373 persons were hospitalized in a burn center or died from a burn injury or smoke inhalation from 1988 to 2000. Twenty percent of those injuries were from house fires (1266/6373); 67% were fatal. Children under 5 and seniors 65 and older had the highest annual injury rates (Table 1). More than eight out of every ten Oklahomans over the age of 65 who were injured in a residential fire died from their injuries.

Among persons of all ages, 62% of injuries occurred among males. African Americans had an annual burn injury rate (6.0 per 100,000) that was twice the rate of whites and Native Americans (2.7 and 2.3 per 100,000, respectively). Nine percent of house fire injuries occurred in someone else's home (103/1266).

Residential house fire fatalities have dropped 25% from 1988 to 2000 (Figure 2). The number of deaths was highest in 1988 (83) and decreased to 62 deaths in 2000.

Among survivors, hospital stays ranged from 1 to 235 days. The average length of stay in a burn center was 19 days.

Of those admitted to a burn center, 26% (142/555) had less than a 10% total body surface area (TBSA) burn. Table 2 shows the relationship of severity of burn and outcome. Death among persons with TBSA burns on 80 to 100% of their body is 2.8 times higher than for persons with TBSA burns on less than 10% of their body.

Among persons over the age of 14, alcohol and drugs were associated with 349 cases (37%). Alcohol was used in 34% (317/946) of cases, with 71% having a blood alcohol level of 0.08 or higher; drugs were used in 8% (71/946) of cases. Thirty-nine cases were positive for both drugs and alcohol. Five percent of injuries were known to be intentional (67/1266).

Figure 2. Number of Residential Fire-Related Injuries by Year and Outcome, Oklahoma, 1988-2000

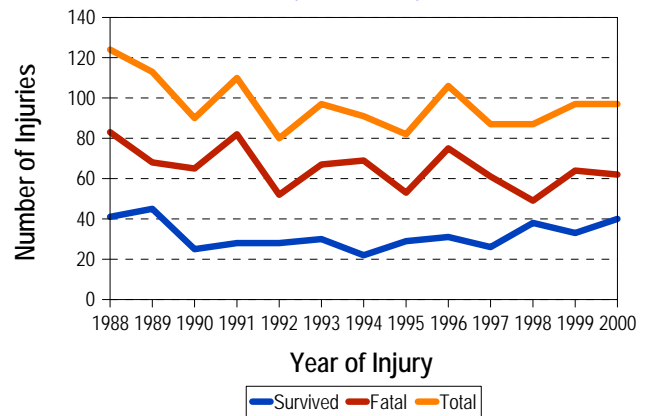


Table 1. Residential Fire-Related Injuries by Age Group, Outcome and Annual Rate, Oklahoma, 1988-2000

Age Group	Number of Injured Persons	Percent of Injured Persons	Annual Rate per 100,000	Number of Fatal Injuries	Case Fatality Rate
0-4	208	16%	7	156	75
5-14	111	9%	2	73	66
15-24	117	9%	2	64	55
25-34	161	13%	3	80	50
35-44	184	15%	3	120	65
45-54	141	11%	3	85	60
54-64	101	8%	3	69	68
65+	238	19%	8	201	84
Total	1261	100%	3	848	67

## YEAR 2010 OBJECTIVES

1. **Reduce residential fire deaths to 0.8 deaths per 100,000 population.**  
**Baseline:** 1.4 deaths per 100,000 population were caused by residential fires in 1998 (crude rate)  
**Target setting:** 42 percent reduction  
**Data source:** OSDH Vital Statistics data, 1998 (includes E codes 890, 891, 895, 896)
2. **Increase functioning residential smoke alarms to 100 percent.**  
**Baseline:** 95 percent  
**Target setting:** Total coverage  
**Data source:** Behavioral Risk Factor Surveillance System, Oklahoma State Department of Health, 2000

## PREVENTION STRATEGIES

**Smoke Alarms:** Between 1978 and 1982, residential fire-related deaths decreased much faster than the decline in residential house fires in the United States; this reduction has been at least partially attributed to the increased use of smoke alarms.<sup>7</sup> Smoke alarms have been proven to be an effective, inexpensive means of preventing house fire injury, although battery

replacement and maintenance is essential. Smoke alarms have been shown to reduce the potential of death in 86% of fires and the potential of severe injuries in 88% of fires<sup>8</sup> and are consistently shown to reduce death during a house fire by about 50%.<sup>5</sup> Oklahoma has legislation requiring tenant-maintained smoke alarms in all multi-family dwellings with more than 4 units, as well as legislation requiring smoke alarms in all newly constructed residential dwellings or remodeled homes that require a building permit. Some cities (i.e., Ardmore) have passed ordinances that also require smoke alarms in all one- and two-family dwellings. Smoke alarm giveaway programs, intended to increase the number of functioning smoke alarms within the community, have also proven effective.<sup>9-13</sup> After enacting a citywide smoke alarm ordinance and implementing a smoke alarm giveaway program, the prevalence of smoke alarms in one- and two-family dwellings in Ardmore increased from 45% to 60%.

**Sprinkler systems:** Sprinkler systems, especially when used in conjunction with a smoke alarm, have been proven effective in preventing injury and the spread of fire;<sup>14-17</sup> studies have shown that many people who would not be saved by smoke alarms (i.e., quadriplegics) could have been saved by

residential sprinklers in conjunction with a smoke alarm.<sup>14</sup> It is estimated that sprinklers alone could reduce residential fire deaths by 69% and the combination of smoke alarms and sprinklers could reduce residential fire deaths by 82%.<sup>15</sup> In a 10-year study of automatic sprinkler systems in Scottsdale,

**Table 2. Number of Residential Fire-Related Injuries by Percent TBSA\* Burned and Outcome, Oklahoma, 1988-2000**

Percent of TBSA Burned	Survived	Fatal	Total Injuries (%)	Case Fatality Rate
1-9	129	11	140 (25%)	8
10-19	103	5	108 (20%)	5
20-39	87	21	108 (20%)	19
40-59	30	24	54 (10%)	44
60-79	11	33	45 (8%)	73
80-100	2	31	33 (6%)	94
SI or Unknown %	49	14	64 (11%)	22
<b>Total</b>	<b>411</b>	<b>139</b>	<b>552 (100%)</b>	<b>25</b>

\*Total Body Surface Area

Arizona, an 89% decrease in property loss was shown in homes where an automatic sprinkler system was installed compared to those without a home sprinkler system (\$1,945 and \$17,067, respectively).<sup>16</sup> Currently, less than one percent of one and two-family dwellings and less than 10% of multi-family units have residential sprinklers.<sup>18</sup> Legislation that requires sprinkler systems in all new housing, as well as in older, high risk, multi-family housing units has been suggested and appears promising.<sup>17-19</sup>

**Fire and burn safety education:** Fire safety education, normally targeted at older persons, preschool or school-age children, as well as the general public appears to be a promising method of preventing fire and burn injuries. Specific messages appear to be more effective than general or multiple messages.<sup>18</sup> Media campaigns should include: 1) information regarding potential fire and burn dangers; 2) recognizing and eliminating environmental hazards in older, high-risk buildings; 3) proper use of flammable items; 4) available burn prevention technologies (i.e., flame resistant clothing); 5) the benefits of smoke alarm and sprinkler systems; and 6) what to do in the event of a house fire. Families with children should discuss calling 911 in the event of an emergency. "Exit Drills In The Home" (E.D.I.T.H.) needs to be included in fire and burn safety education, including planning and practicing two ways out of every room as well as a family meeting point outside the home. Education also needs to include never re-entering a burning home. "Stop, Drop, and Roll" and other burn prevention messages (i.e., "Crawl Low Under Smoke") may also be useful in preventing fire and burn injuries.

The *Oklahoma Elementary School Injury Prevention Education: The Subject-Integrated Safety Curriculum for Teacher* is a comprehensive, grade-specific 25-lesson injury prevention curriculum for children in

grades K-5, that includes lessons such as bicycle safety, motor vehicle safety, water safety, burn prevention, and first aid.

Evaluation results of the case control study showed a significant increase in seat belt use (15%) and bicycle helmet use (10%) in the program schools compared to no increase in the control schools.<sup>20</sup>

Another educational tool that is available is *Risk Watch*. This is a curriculum developed by the National Fire Protection Association, it is a grade-specific curriculum designed to teach students about injury prevention. A three-year evaluation of the curriculum was completed in 2001, which shows that *Risk Watch* is an effective way to increase preschool through eighth grade students' knowledge on safety issues.<sup>21</sup>

**Flammability standards:** One method of preventing the ignition of clothing and other materials involves regulation of flammable fabrics. Such passive interventions to prevent fire and burn injuries require minimal action on the part of the user and can be very effective. Flammability standards, such as the Children's Sleepwear Standard and the 1973 Mattress Flammability Standard, requiring manufacturers to produce a fire-safe material, are examples of passive intervention that have proven effective in reducing injury risk among children.<sup>19</sup> After the 1971 standards were adopted, the average number of clothing-related injury burn deaths for children under 14 years of age went from 60 deaths per year to 4.<sup>22</sup> However, in 1997 and again in 1999, the Consumer Products Safety Commission (CPSC) voted to relax the flammability standards among children's clothing. The current relaxed standard excludes children under the age of 9 months from the sleepwear flammability standard and allows non-flame resistant sleepwear for children to be sold if it is tight-fitting. The four Shriners Burn Hospitals in the United States

compared sleepwear-related burn injuries in children during 1995 and 1996 to 1998 and 1999 and found a 157% increase in the number of sleepwear-related burn injuries in children since the CPSC relaxed the standards for sleepwear. When looking at children aged 0 to 9 months, the increase was 167%.<sup>22</sup> Information needs to be distributed to the parents and caregivers of Oklahoma's children on the best way to protect their children under the new relaxed standards. Sleepwear for children must fit the child's current size and not allow growth room because this allows air to get in between the clothing and the child's skin and increase the chance of a burn from fire.

***Building Codes:*** A number of studies found that children from low-income families have significantly higher rates of injury resulting from house fires.<sup>23-25</sup> A study by Istre, et al. shows that injuries rates are eight times higher for persons in the lowest median income tract (below \$20,000 per year) than persons in the highest median income tract (above \$80,000 per year).<sup>24</sup> The higher prevalence of environmental hazards, such as faulty heating and electrical systems, appears to be a contributing factor. Improper or faulty electrical and heating equipment have been shown to be nine times more common in low-rental census tracts than in

high-rental census tracts.<sup>26</sup> Most cities have ordinances, based on model building codes that establish standards for both new and existing dwellings. Inspection and enforcement of existing building codes can be effective in eliminating fire hazards often present in these older, high-risk dwellings. Local fire departments may also assist in onsite inspections of buildings within city or county limits.

***Fire-safe cigarettes:*** One of the most common ignition sources of house fires is a cigarette dropped on a flammable source such as furniture or bedding. Nationally, cigarettes are the single leading cause of residential fire deaths by a wide margin.<sup>27-29</sup> A fire-safe cigarette is a cigarette less likely to burn or smolder and result in fire. In 1984, the Cigarette Safety Act established a study group, which showed that a fire-safe cigarette was possible. In 1990, the United States Congress, to further research fire-safe cigarettes, established another technical study; a final report to Congress was made available in late 1993. The report concluded there are fire-safe cigarettes on the market. In 2000, New York State passed the first law in the country requiring that only fire-safe cigarettes be sold in the state. The law calls for cigarettes that self-extinguish to be sold statewide by 2003.<sup>30</sup>

## RECOMMENDED STRATEGIES FOR THE PREVENTION OF RESIDENTIAL FIRE INJURIES

### RECOMMENDATION

1. Continue statewide surveillance of burn injuries.
2. Increase the number of functioning smoke alarms in single and multi-family dwellings.
3. Increase the number of sprinkler systems in family dwellings.

### IMPLEMENTATION PLAN

- 1a. Provide state funding to continue surveillance of fire and burn injuries by 2005.
- 2a. Make smoke alarms available in all county health departments for persons in need by 2006.
- 2b. Utilize existing state health department programs that make home visits to check smoke alarm status for high-risk groups they serve by 2005.
- 2c. Educate Oklahoma emergency medical personnel (EMSA, REACT, etc.) on the importance of checking smoke alarm status while they are in the home and reporting findings on run reports by 2005.
- 2d. Disseminate reminders to smoke alarm program participants to remind them to test their smoke alarms by 2006.
- 2e. Increase awareness among Oklahoma property owners of multi-family dwellings regarding their responsibility to provide working smoke alarms in their rental properties and advise of monetary penalties by 2006.
- 2f. Screen clinic patients for smoke alarm status in all county health department programs by 2005.
- 2g. Increase collaboration with local fire departments and Turning Point coalitions to develop and implement smoke alarm programs by 2005.
- 3a. Implement a statewide educational campaign targeting homebuilders regarding the efficacy of sprinkler use in all newly constructed family dwellings by 2005.

## RECOMMENDATION

3. Increase the number of sprinkler systems in family dwellings. (continued)
  
4. Expand and implement residential fire and burn prevention and safety education programs.

## IMPLEMENTATION PLAN

- 3b. Educate legislators on the benefits of residential sprinkler systems in new or remodeled single or multi-family dwellings by 2005.
  
- 4a. Evaluate existing fire and burn prevention and safety educational programs; develop and support prevention and educational programs proven to be most effective by 2006.
  
- 4b. Implement statewide multi-media campaigns targeting high-risk fire and burn injury behaviors such as cigarette smoking, use of alcohol, improper use of gasoline, and failure to maintain smoke alarms by 2005.
  
- 4c. Educate state legislators on the benefits of fire prevention materials such as flammability standards for clothing and furniture by 2006.
  
- 4d. Utilize existing targeted groups such as American Association of Retired Persons and Area Wide Aging Agency to further educate high risk Oklahomans about fire and life safety by 2005.
  
- 4e. Implement a statewide educational campaign targeting seniors and their family members, which outlines clothing-related fire and burn risk factors (i.e., cooking and smoking) by 2006.
- 4f. Train available county health department staff to provide education to clients and the public regarding fire education and life safety by 2005.

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## BACKGROUND

**National Data.** Motor vehicle travel is the primary means of transportation in the United States. Although there have been sharp declines in motor vehicle-related deaths since 1925,<sup>1</sup> traffic crashes remain a leading cause of injury death in the U.S. resulting in more than 40,000 deaths each year, an estimated 500,000 hospitalizations, and 4 million emergency department visits.<sup>2</sup> It is estimated that an American is injured in a traffic crash every 14 seconds, and every 13 minutes someone is killed.<sup>3</sup> The economic cost of motor vehicle crashes in 2000 totaled \$230.6 billion.<sup>4</sup>

Traffic crashes are the leading cause of death for persons 1-34 years of age. Certain age groups are at higher risk for dying in a motor vehicle crash, including children, teenagers, and older adults.<sup>5</sup> Although child deaths in crashes have declined since 1975, motor vehicle crashes still cause about 1 of every 3 injury deaths among children.<sup>5</sup> Among children 4-12 years old, crash injuries are the leading cause of death.<sup>6</sup> Among children 0-14 years of age, Native American children have the highest death rates (3.42 per 100,000 compared to 1.83 and 1.58 for African Americans and whites, respectively).<sup>5</sup> The risk of motor vehicle crash (MVC) is higher among 16-19 year olds than among any other age group. Per mile driven, teen drivers 16-19 are 4 times more likely than older drivers to crash. In 2001, teens represented 10% of the US population, but accounted for 15% of MVC deaths.<sup>7</sup> Crash

rates are high largely because of young drivers' immaturity combined with driving inexperience. The immaturity is apparent in young drivers' risky driving practices like speeding and tailgating. At the same time, teenagers' lack of experience behind the wheel makes it difficult for them to recognize and respond to hazards. Crashes involving young drivers typically are single-vehicle crashes, primarily run-off-the-road crashes, that involve driver error and/or speeding. They often occur when other young people are in the vehicle with the young driver, so teenagers are disproportionately involved in crashes as passengers as well as drivers.<sup>8</sup> Older persons have higher rates of fatal crashes than all but the youngest drivers, especially per mile driven.<sup>8</sup> This is largely due to their increased susceptibility to injury, particularly chest injuries and medical complications. Since 1975, deaths of older passenger vehicle occupants has increased by nearly 60%.<sup>9</sup>

**Oklahoma Data.** From 1999-2000, injuries were the 3<sup>rd</sup> leading cause of death and the leading cause of years of potential life lost before age 75 (YPLL-75) in Oklahoma;<sup>5</sup> traffic injuries accounted for 11% of all YPLL-75 and 29% of injury deaths. Oklahoma ranks 10<sup>th</sup> in motor vehicle fatality death rates per 100,000 licensed drivers and 16<sup>th</sup> in fatalities per 100,000 population.<sup>9</sup> According to Oklahoma Vital Statistics data, from 1992 to 2001, 6,833 residents were killed in traffic-related events. Of those deaths, 3,707 (54%) were motor vehicle occupants, 568 (8%) pedestrians, 229 (3%) motorcyclists, and 41

(1%) bicyclists. There were 2,283 deaths that were unspecified; it is likely those deaths were occupant deaths. The Oklahoma motor vehicle fatality rate was 32% higher than the U.S. rate (11.7 and 8.8 per 100,000 population, respectively).<sup>5</sup> In Oklahoma, traffic death rates among rural populations were 74% higher than death rates for urban populations (27.7 and 15.9, respectively). Sixty-four percent of persons who died in traffic crashes were not using a seat belt. From 1992 to 2001, 157 children 0-9 years of age died as a result of a motor vehicle crash; 91 deaths were among children 0-4 years of age.

The traffic fatality rate for males was almost twice that for females (27.5 and 14.2 per 100,000 population, respectively). Fatality rates were highest among teenagers, young adults, and males 75 years of age and older (Figure 1). Thirty-eight percent of persons older than 14 years of age and tested for blood alcohol concentration (BAC) had a positive BAC. More than half of persons 25-44 years of age had a positive BAC (Figure 2). Additionally, more than half of Native Americans had a positive BAC (59%) compared to 39% for African Americans and 36% for whites.

Severe nonfatal neurologic injuries may result in lifetime disability and costly injuries; a total of 10,336 persons suffered a traumatic brain injury (TBI) in a traffic crash from 1992-2001, including 100 children. Only 29% of persons with TBI were known to be using a seat belt or car seat. During 1994, acute care hospitalization charges for persons with TBI in Oklahoma were estimated at \$37.7 million (unpublished data).

From 1988-2001, 974 individuals in Oklahoma were hospitalized for a traumatic spinal cord injury (SCI) resulting from a traffic

event. The gender-specific rate of traffic-related SCI among males was over twice that for females (3.1 and 1.5, respectively). Eighty-five percent of traffic-related SCI were among vehicle occupants. Of those, the majority were occupants of cars (63%), followed by pickups (25%), vans (4%), sports-utility vehicles (3%), and other or unknown vehicles (6%). Among persons who suffered an MVC-related SCI in which they

Figure 1. Rate of Traffic Deaths by Age Group and Gender, Oklahoma, 1992-2001

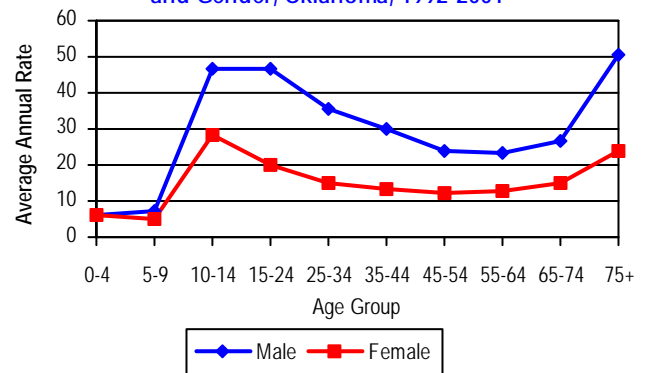
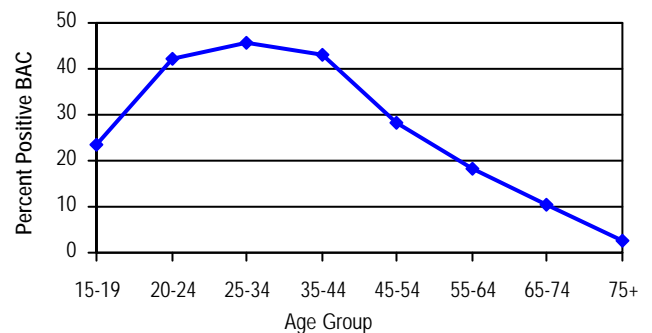


Figure 2. Traffic Deaths by Age Group and Percent Positive BAC, Oklahoma, 1992-2001



were motor vehicle occupants, only 28% were wearing a seat belt at the time of the crash.

**Legislation.** During the past decade, laws were passed in Oklahoma with a potential to impact traffic injuries and deaths.

- ✓ *Zero Tolerance.* No measurable alcohol for drivers under age 21, 47 O.S. § 11-906.4. Enacted in 1996 with passage of SB 1230, effective November 1, 1996.

- ✓ *Lowering of blood alcohol content necessary to convict for DUI to .08*, 47 O.S. § 11-902. Enacted in 2001 with passage of SB 437, effective July 1, 2001.
- ✓ *Removal of the 55 mile per hour (mph) speed limit*, 47 O.S. § 11-801. Enacted in 1996 with passage of SB 685, effective June 12, 1996.
- ✓ *Primary enforcement of seat belt law* (can only ticket for adult front seat occupants not wearing seatbelts), 47 O.S. § 12-417. Enacted in 1997 with passage of HB 1443, effective November 1, 1997.
- ✓ *Child passenger restraint law*, 47 O.S. § 11-1112. Originally enacted in 1983 with passage of HB 1005, effective November 1, 1983. Modified to apply to children under 60 lbs. by SB 465, effective July 1, 1995. Modified to apply to children "At least 4 but younger than 13 years of age" by SB 891, effective November 1, 2000.

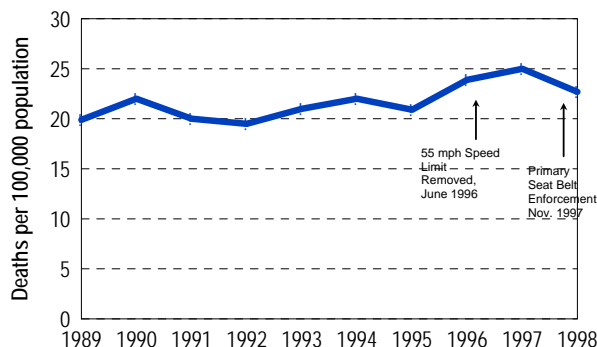
The impact of legislation over the past decade has not been empirically analyzed, however, removal of the 55 mph speed limit, may correlate to an increase in traffic deaths, while primary enforcement of the seat belt law may correlate with a decrease in traffic deaths (Figure 3).

## HEALTHY OKLAHOMANS YEAR 2010 OBJECTIVES FOR TRAFFIC SAFETY

To guide prevention efforts over the next 10 years, the following objectives were modeled after National Healthy People 2010 objectives to be the framework for the Injury Free Oklahoma: Strategic Plan for Injury and Violence Prevention for reducing traffic deaths and injuries. Baseline data was identified for each objective and target setting was modeled

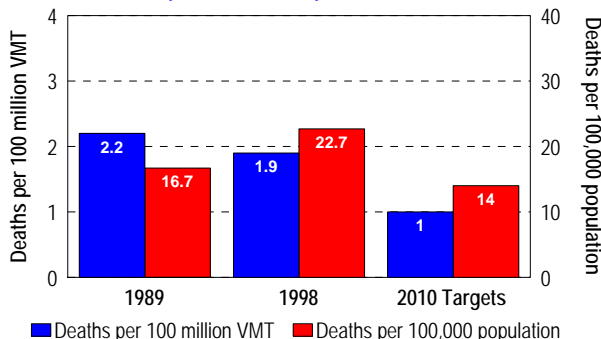
after National Healthy People 2010. Developmental objectives indicate areas do not have baseline data and need to be placed on the agenda for data collection. They address subjects of sufficient importance that investments should be made over the next decade to measure their change.

Figure 3. Traffic Deaths and Legislation, Oklahoma, 1989-1998\*



\*Oklahoma Vital Statistics, 1989-1998. Includes E codes 810-819, 958.5, 968.5, and 988.5.

Figure 4. Historical and 2010 Targets Traffic Deaths per 100 million VMT\* and Deaths per 100,000 Population\*\*, Oklahoma



\*Oklahoma Crash Facts 1998, Office of Highway Safety.  
\*\*Oklahoma Vital Statistics, 1998.

1. Reduce deaths and injuries caused by motor vehicle crashes (MVC) (Figure 4).

1a. Deaths per 100,000 population

1998 Baseline: 22.7\*    2010 Target: 14.0

1b. Deaths per 100 million vehicle miles traveled

1998 Baseline: 1.9\*    2010 Target: 1.0

\*Crude rate

**Data sources:** OSDH Vital Statistics data, 1998 (includes E codes 810.0-819.9, 958.5, 968.5, 988.5) for deaths per 100,000 population; *Oklahoma Crash Facts*, Oklahoma Department of Public Safety, 1998, for deaths per 100 million vehicle miles traveled.

**1c. Reduce nonfatal injuries caused by motor vehicle crashes to 1,189 nonfatal injuries per 100,000 population.**

**Baseline:** 1,505 nonfatal injuries per 100,000 were caused by motor vehicle crashes in 1998 (crude rate)  
**Target setting:** 21% reduction  
**Data source:** Oklahoma Crash Facts, Department of Public Safety, 1998

**1d. Reduce deaths and injuries caused by alcohol- and drug-related motor vehicle crashes.**

Alcohol/drug MVC deaths per 100,000 population  
**Baseline:** 5.1\*                      **2010 Target:** 4.0  
 Alcohol/drug MVC injuries per 100,000 population  
**Baseline:** 143.0\*                  **2010 Target:** 65.0  
 \*Crude rate  
**Data source:** Oklahoma Crash Facts, Department of Public Safety, 1998

**1e. Reduce the proportion of adolescents in grades 9-12 who report they rode during the previous 30 days with a driver who had been drinking alcohol.**

**Baseline Data:**  
 Developmental objective.  
**Possible data source:**  
 OSDH Youth Risk Behavior Survey, 2002

**1f. Increase the use of seat belts to 92% (Figure 5).**

**Baseline:** 70% usage in 2002.  
**Target setting:** National objective  
**Data source:** Oklahoma Seat Belt Observation Study: Summer 2000, Institute for Public Affairs, University of Oklahoma

**1g. Increase the use of car seats to 100% (Figure 5).**

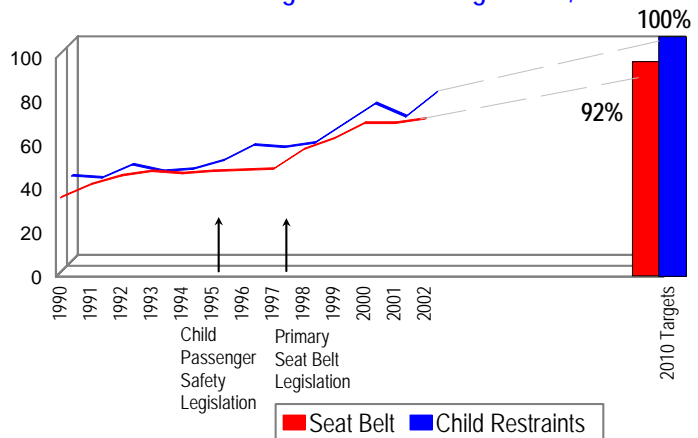
**Baseline:** 77% usage in 2002.  
**Target setting:** Total coverage  
**Data source:** Oklahoma Seat Belt Observation Study: Summer 2000, Institute for Public Affairs, University of Oklahoma

**2. Reduce nonfatal neurologic injuries.**

**2a. Reduce nonfatal head injuries to 54.2 hospitalizations per 100,000 population.**

**Baseline:** 75.2 hospitalizations for nonfatal head injuries per 100,000 population in 1999 (crude rate)  
**Target setting:** 28% reduction  
**Data source:** Traumatic Brain Injury Surveillance System, Injury Prevention Service, 1999 (includes ICD-9-CM codes 800.0-801.9, 803.0-804.9; 850.0-854.1; 959.01)

**Figure 5. Historical and 2010 Targets  
 Seat Belt and Child Passenger Restraint Usage Rates, Oklahoma**



\*Oklahoma Seat Belt Observation Studies and Oklahoma Car Seat Observation Studies (1990-2000).

**2b. Reduce nonfatal spinal cord injuries to 2.0 hospitalizations per 100,000 population.**

**Baseline:** 3.6 hospitalizations for nonfatal spinal cord injuries per 100,000 population in 1999 (crude rate)

**Target setting:** 44% reduction

**Data source:** Traumatic Spinal Cord Injury Surveillance System, Injury Prevention Service, 1999 (generally includes ICD-9 codes 806, 952, but must have a neurologic deficit)

**2c. Increase the use of helmets by bicyclists less than 15 years of age to 50 percent.**

**Baseline:** 19 percent of bicyclists wore helmets in 2000

**Target setting:** 163% increase

**Data source:** Behavioral Risk Factor Surveillance System, Oklahoma State Department of Health, 2000

**3. Reduce pedestrian deaths and injuries.**

**3a. Reduce pedestrian deaths to 0.7 deaths per 100,000 population.**

**Baseline:** 1.4 pedestrian deaths per 100,000 occurred in 1998 (crude rate)

**Target setting:** 50% reduction

**Data source:** OSDH Vital Statistics data, 1998 (includes E codes 810-819 (.7)).

**3b. Reduce nonfatal pedestrian injuries to 14.1 nonfatal injuries per 100,000 population.**

**Baseline:** 19.0 nonfatal pedestrian injuries per 100,000 occurred in 1998 (crude rate)

**Target setting:** 26%

**Data source:** Oklahoma Crash Facts, Department of Public Safety, 1998

## PREVENTION STRATEGIES

There are several prevention strategies that have been proven effective through research and evaluation to reduce traffic deaths and injuries. These strategies are briefly described below.

**Seat belt use** — Seat belts are estimated to reduce the risk of death among front seat car occupants by 45% and the risk of moderate to critical injury by 50%.<sup>10,11</sup> Among occupants of light trucks, seat belts are estimated to reduce fatal injury by 60% and moderate to critical injury by 65%. In addition, the data suggests that seat belts may reduce hospital admissions by 65 percent and hospital charges by 67 percent. Between 1975 and 1999, it is estimated that 123,000 lives were saved by seat belt use.<sup>10,11</sup> To be most effective, seat belts should be worn properly: over the shoulder, across the chest, and low across the hips. Seat belts, when properly worn, have been shown to protect against fetal harm among pregnant women.<sup>12,13</sup>

Oklahoma's current law requires seat belts to be worn by the driver and front-seat passengers (see Car Seat Use for information about children). Oklahoma has a primary enforcement law meaning that an officer can stop and cite a driver if the driver or front seat passenger are not buckled. Overall seat belt use in Oklahoma among drivers and front seat passengers increased from 40 percent in 1992 to 70 percent in 2002. Seat belt usage was highest among automobile occupants (76%) compared to pickup occupants (58%).

**Car seat use** — Motor vehicle injuries are a prominent cause of death and disability for children of all ages. The trauma causing most deaths and disabilities occurs a fraction of a second after a crash, when an unrestrained child strikes the vehicle interior. In addition to injuries in crashes, many children are injured during non-crash incidents such as striking the vehicle interior

during a sudden stop, turn, or swerve and are most common among unrestrained children 1-4 years of age. Research has found that the correct use of car safety seats may reduce fatal injury by 70% among infants less than one year of age, and 47% for toddlers (1-4 years of age) in passenger cars.<sup>14,15</sup> Among infants and toddlers in light trucks, car safety seats are found to reduce fatal injury by 58% for infants and 59% for toddlers.<sup>15</sup> Oklahoma law requires that all children less than 4 years of age be buckled in an approved car seat. Children 4-12 years of age are required to be buckled in a car seat or seat belt regardless of their seating position in a vehicle. Car seat use in Oklahoma increased from 44% in 1992 to 78% in 2002.

***Booster seats*** — Once a child outgrows a convertible car seat that fits children 40 pounds and 40 inches (approximately 3 years of age), parents often use a seat belt to restrain the child. However, seat belts are designed for persons 4'9" tall and weighing approximately 80 pounds (approximately 9 years of age). Belt-positioning booster seats lower the risk of injury in crashes by 59% compared to the use of vehicle seat belts.<sup>16</sup>

***Car seat inspection clinics*** — Studies have indicated that as many as 4 out of 5 car seats may be installed incorrectly.<sup>17</sup> Children may be severely injured or killed if they are improperly restrained. Common errors include facing the seat the wrong direction, using the wrong car seat for a child's height and weight, not buckling the car seat in tightly enough with the vehicle seat belt, and putting a rear-facing infant seat in front of an air bag. Car seat inspection clinics where trained child passenger safety technicians inspect car seats for correct installation, make necessary corrections, and educate parents and caregiver, are available through several Oklahoma organizations including, the Oklahoma SAFE KIDS Coalition, county

health departments, and Emergency Medical Services Authority in Oklahoma City and Tulsa.

***Car seats for children with special needs*** — Children with disabilities who are not able to sit in an approved car seat should also be properly secured. There are protective restraints available for children with special needs such as premature or low birth weight infants, small children in hip spica casts, larger children who have full body casts, and children with poor trunk and head control.

***Graduated licensing*** - Graduated driver licensing (GDL) systems are designed to phase in beginning drivers to full driving privileges through a three-stage process as they mature and develop their driving skills, instead of the traditional approach in which a young driver gets unrestricted driving privileges after passing a test.<sup>18,19,20</sup> Evaluations of these systems have demonstrated crash reduction impacts of up to 16% among Oregon males,<sup>21</sup> 5-9% in Maryland and California,<sup>19</sup> 9% in Canada<sup>21</sup> and 8% in New Zealand.<sup>22</sup> In North Carolina, the number of fatal crashes among 16 year-old drivers dropped by 57% from 1996-1999, and the number of nonfatal injury crashes dropped by 27%.<sup>23</sup> In Michigan overall crash risk for 16 year-olds was reduced by 25%.<sup>24</sup> Model GDL systems have a minimum age of entry (usually 15 1/2) and require one to two full years to complete a 3-tiered licensing program: learning stage, intermediate stage, and full licensure. Graduated licensing ensures that the initial driving experience is accumulated under lower-risk conditions, usually imposing a nighttime driving restriction and passenger limits for young novice drivers. In a 1994 report to Congress, National Highway Traffic Safety Administration (NHTSA) showed that driver's education alone did not significantly reduce crashes among teenagers.<sup>25</sup> Other subsequent reports indicate that, in fact, it

may even be detrimental.<sup>26</sup> Currently, NHTSA recommends integrated driver's education training, taught progressively, into graduated licensing systems.

#### ***Addressing the needs of mature drivers –***

As people age, their ability to drive a motor vehicle may be compromised by a variety of functional impairments. Because the number of older drivers is increasing, there is a need to develop screening procedures for license renewal and regulatory control that are fair, accurate, and can be administered cost-effectively. The National Highway Traffic Safety Administration has a research project entitled "Model Driver Screening and Evaluation Program."<sup>27</sup> The Model Program has identified tools for evaluation of drivers' functional capabilities.

The Oklahoma Department of Public Safety has a mature drivers program with a Medical Advisory Board. The DPS may place restrictions upon a driver at a physician's request. In Oklahoma, there are no additional tests required for license renewal (including vision tests) beyond the initial drivers license test. Physicians need to be aware of the medical conditions that interfere with driving abilities and be willing to make recommendations for driving restrictions. Primary-care physicians may be reluctant to make such recommendations. Referrals to *geriatric specialists trained in assessing driving abilities and making recommendations for restrictions* are needed. Mature individuals may also need retraining to improve their driving skills after a serious illness. In Oklahoma, there is one rehabilitation facility in the state that can assess driving abilities through road testing, and provide needed retraining when functional abilities for driving are inadequate. Currently, medical insurance does not cover this type of assessment because impaired driving ability is not considered a medical necessity. *Adequate transportation systems for the elderly* may be

the most promising strategy to prevent older persons from driving when they are no longer able. The NHTSA, Federal Highways Administration (FHWA), the Federal Transit Administration, the Administration on Aging, and the National Institute on Aging have jointly proposed programs to assess transportation for the elderly. Simple methods proposed to regulate problem older drivers tend to place unnecessary limitations on drivers who do not pose safety problems and the development of appropriate assessment measures based on empirical evidence are needed.<sup>28</sup>

#### **Preventing Alcohol and Drug Impaired Driving**

##### ***Lowering the legal blood alcohol concentration (BAC) limit***

—Scientific evidence shows that driving skills begin to deteriorate markedly at 0.05 BAC. Lowering the legal BAC limit has proven successful in reducing alcohol-related MVC injuries in many states. Some states that have enacted 0.08 laws have experienced a 5% greater post-law decline in the proportion of alcohol-related fatal crashes than neighboring states without 0.08 laws. Since 2001, Oklahoma's legal BAC limit is 0.08.

##### ***Maintaining minimum legal drinking age laws***

—Minimum legal drinking age laws specify an age below, which the purchase and consumption of alcoholic beverages is not, permitted. In Oklahoma, a person must be 21 years of age to purchase alcohol. Increasing the minimum age for alcohol purchase to 21 has been shown to decrease the number of fatal alcohol-related MVCs among teenagers.

##### ***Zero Tolerance Drinking Laws for Persons Less than 21 Years of Age***

—Laws establishing a lower legal BAC for persons less than 21 years of age are strongly recommended.<sup>29</sup> Oklahoma currently has a "zero tolerance" law, which prohibits drivers

less than 21 years of age from driving with any measurable amount of alcohol (usually above 0.02) in their system. A zero tolerance law allows law enforcement officials to require a breath test from a driver less than 21 years of age if the officer has probable cause to believe the driver has been drinking. If the driver refuses the test or the test reveals any measurable alcohol level, then the driver is subject to sanctions, including loss of his or her driver's license. In 1997 following enactment of the zero tolerance law in Oklahoma, alcohol involvement in crashes among 15-19 year-olds dropped by 16% from 3,173 in 1997 to 2,659 in 2000 (Oklahoma Office of Highway Safety, Oklahoma's 2003 problem identification. 2002 edition.).

***Sobriety Checkpoints*** – Sobriety checkpoints are designed to systematically stop drivers to assess their level of alcohol impairment. The goal is to deter alcohol-impaired driving by increasing the perceived risk of arrest.<sup>29</sup> Sobriety checkpoints have been effective in reducing alcohol-impaired driving, alcohol-related crashes, and associated fatal and nonfatal injuries in a variety of settings and among various populations.<sup>29</sup>

***Server training and designated driver programs*** — Server training programs teach waiters, waitresses, and bartenders how to identify customers who are already intoxicated so they can avoid serving intoxicated customers. High-quality, face-to-face training, when accompanied by strong management support, is effective in reducing the level of intoxication among patrons.<sup>29</sup>

***Identification and referral of impaired drivers through emergency department protocols*** – Alcohol/drug-impaired persons treated for injuries in an emergency department as a result of a motor vehicle crash are identified and referred for substance abuse treatment. A brief

screening and intervention protocol is conducted in the emergency department.<sup>30</sup> Many people who drive while intoxicated interact with the health care system through Emergency Medical Services (EMS). The rationale of this intervention is to identify persons with alcohol abuse/dependence problems who may be at further risk for alcohol-related crashes. There is evidence that high-risk patients will be responsive to the intervention.<sup>31,32,33,34,35</sup> However, further research will be needed to determine the effects on drinking and driving.

***Driving while intoxicated tracking systems*** —National Highway Traffic Safety Administration and the National Commission Against Drunk Driving has recommended that states develop comprehensive driving while intoxicated (DWI) tracking systems at the case level to improve the documentation of repeat DWI offenders. Inadequate data and tracking systems often allow chronic repeat offenders to circumvent the judicial system, and avoid DWI penalties and sanctions. Additionally, improved DWI tracking systems and data collection will improve the ability to evaluate the effectiveness of DWI countermeasures.<sup>36</sup>

## **Preventing Bicycle Injuries Among Youth and Adolescents**

***Bicycle helmet campaigns*** — Bicycle helmets have been found to be 85 to 88 percent effective in reducing or preventing brain injuries.<sup>37</sup> If every person wore a helmet while riding, one life would be saved every day, and one brain injury would be prevented every 4 minutes.<sup>38</sup> Organized, community-wide bicycle injury prevention programs focusing on increasing bicycle helmet use have shown promise.<sup>39</sup> Successful helmet interventions have used a broad scope that combines media announcements, bike rodeos, and free or discounted helmets. Additionally, bicycle

helmet interventions among children have been found to be successful when parents participate, and when other riding partners also wear helmets (whether adults or children).<sup>40</sup> Free helmet distributions have been effective in increasing helmet use among groups of low socioeconomic children. In Oklahoma, community-based bicycle helmet programs have been implemented since 1993. Reported bicycle helmet use among children statewide has increased from 4 percent in 1992 to 19 percent in 2000. Oklahoma traumatic brain injury surveillance data documented a 43 percent decrease in bicycle-related traumatic brain injuries among children 5-9 years of age and a 45 percent decrease in children 10-12 years of age from 1992 to 2000. While all of the factors that contributed to this decline are not known, increasing education and helmet use in program communities across the state likely contributed to the decline in injuries.

### **Preventing Pedestrian Injuries**

**Roadway countermeasures** — Roadway countermeasures such as: 1) converting two-way streets to one-way streets; 2) installing adequate roadway lighting; 3) requiring

sidewalks be constructed in new rural and suburban housing subdivisions; 4) installing barriers to physically separate pedestrians from vehicles; 5) installing pedestrian crossing signs in unusually hazardous locations; and 6) utilizing crossing guards in school zones have proven effective in reducing the number of pedestrian injuries.

***Pedestrian safety programs for school-age children*** — Children are especially vulnerable to pedestrian death because they face traffic threats that exceed their cognitive, developmental, behavioral, physical and sensory abilities.<sup>41</sup> Research has shown that engineering modifications have the potential for a much greater impact on pedestrian injuries than education and enforcement.<sup>42,43,44,45</sup> Additionally, some researchers have recommended changes in policies to encourage walking and bicycling for short trips.<sup>45</sup> Programs that employ a combination of strategies including school-based education programs and adult accompaniment to and from school such as Safe Routes to School programs<sup>46,47,48,49,50,51</sup> have been shown to reduce the risk of pedestrian injury.



## RECOMMENDATION

2. Increase the proper use of child passenger restraints for children who are transported in vehicles to 100%. (continued)
  
  
  
  
  
  
  
  
  
  
3. Decrease traffic injuries due to impaired drivers.

## IMPLEMENTATION PLAN

- 2b. Seek funding to provide free or low-cost car seats and parental education on the proper use of the car seats to families meeting the eligibility criteria for the Women's, Infants, and Children (WIC) program through county health departments by 2005.
- 2c. Conduct car seat inspection clinics and provide training to certify child passenger safety (CPS) technicians and trainers in county health departments on an ongoing basis.
- 2d. Provide ongoing technical updates for certified child passenger safety technicians on an ongoing basis.
- 3a. Promote enforcement of the current drinking and driving laws and the penalties for DUI on an ongoing basis.
- 3b. Partner with the Oklahoma Office of Highway Safety, the Oklahoma Highway Patrol, the Association of Chiefs of Police, the American Automobile Association, and other agencies to conduct an educational campaign through the media and junior and senior high schools on the prevention of driving under the influence of alcohol and drugs by 2005.
- 3c. Support the enforcement of DUI/DWI penalties, Oklahoma's ALR (administrative license revocation) law, DRAM shop laws, minimum drinking age laws, and zero tolerance laws on an ongoing basis.
- 3d. Prepare a White Paper on the problems with the current state of DUI/DWI enforcement in Oklahoma addressing the DUI/DWI data tracking systems by 2005.
- 3e. Conduct an education campaign through the media and senior citizens groups to reduce traffic injuries due to older drivers with medical conditions that impair their ability to drive by 2005.
- 3f. Prepare reports from trauma registry data on traffic injuries and the involvement of drug and alcohol impaired driving on an ongoing basis.

## RECOMMENDATION

4. Increase bicycle helmet use to 50%.
5. Reduce pedestrian deaths and injuries among persons of all age groups.
6. Review drivers licensing standards in Oklahoma and make recommendations for change where necessary.

## IMPLEMENTATION PLAN

- 4a. Seek funding to purchase and distribute bicycle helmets to children under 15 years of age, and conduct bicycle safety education in county health departments and schools by 2006.
- 4b. Work with Turning Point communities to identify funding sources to conduct bicycle safety programs and incentive programs including designating alternate bike paths that are separated from traffic routes by 2005.
- 4c. Support helmet use rules for children that ride bicycles to school and city ordinances that require the use of helmets for bicycle riders on an ongoing basis.
- 5a. Partner with communities to identify safe walking routes separating walk paths from traffic routes (see also recommendation 4b) by 2005.
- 6a. Review drivers licensing standards for all age drivers including mature drivers, and monitor model programs for mature/impaired drivers by 2005.
- 6b. Provide educational materials to organizations working to strengthen the Graduated Drivers Licensing laws in Oklahoma to meet the recommendations for best practices by 2005. *The National Highway Traffic Safety Administration and the American Association of Motor Vehicle administrators recommends that a basic graduated licensing system should include three-stage provisional licensing system (learner's permit, intermediate license, and full license). Restrictions are recommended during each provisional stage (e.g. restrictions on night time driving, limits on the number of passengers under 21 years of age, and requiring a licensed driver over 21 years of age in the front seat, etc.). A driver's education component is recommended in the learner's permit stage (driving skills training) and the intermediate stage (advanced driver's education).<sup>21</sup>*

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