# INJURY UPDATE

*A Report to Oklahoma Injury Surveillance Participants**

**September 30, 2003**


## Fire Prevention Week

The origins of Fire Prevention Week go back to one of the worst fire tragedies in American history, the Great Chicago Fire that began on October 9, 1871. The beginnings of the fire cannot be confirmed but one popular legend imparts the disaster to a cow. It has been said that Mrs. Catherine O'Leary was milking her cow when the animal kicked over a lantern, which set the barn on fire. The blaze spread from there and engulfed more than 2,000 acres of Chicago in 27 hours. In the end, the tragedy claimed the lives of over 300 people, left 100,000 people homeless and destroyed more than 17,000 structures.

President Woodrow Wilson proclaimed October 9, 1920 as the first National Fire Prevention Day. In 1925, President Calvin Coolidge went a step farther proclaiming the Sunday through Saturday period in which October 9 falls as Fire Prevention Week. President Coolidge noted in 1924 some 15,000 lives were lost due to fires in the United States. Even then, President Coolidge realized that deaths from residential fires could be prevented stating, "This waste results from conditions which justify a sense of shame and horror; for the greater part of it could and ought to be prevented…It is highly desirable that every effort be made to reform the conditions which have made possible so vast a destruction of the national wealth."[1]

Since then extraordinary efforts have been made to protect the lives of Americans against fire injuries. Technological advancements (i.e., smoke alarms or sprinkler systems) have made the efforts more effective.

### Fire Prevention Week Safety Quiz

1. Smoke from a house fire can be so thick that your house will be completely dark in
   a. Less than 4 minutes
   b. 12-15 minutes
   c. More than 20 minutes
   d. It never gets that thick

2. What is the best way to survive a house fire?
   a. Install a smoke alarm
   b. Plan and practice a home escape plan
   c. Know 2 ways out of every room
   d. All of the above

3. How often should you test your smoke alarm?
   a. Once a month
   b. Once a year
   c. Never, I know it is working

4. How often should you change the battery in your smoke alarm?
   a. Once a month
   b. Once a year
   c. Once every 5 years
   d. Never because it will last forever

5. Space heaters or other heating equipment should be placed
   a. On the floor next to you
   b. Right next to the pile of papers you collect
   c. On the floor about 3-feet from anything that burns
   d. Wherever you want to put them

6. Fire injuries can be devastating. What populations below are at increased risk for house fire-related injuries?
   a. Children under 5 and adults over 65
   b. People who live in manufactured housing (i.e., mobile homes)
   c. People that live in rural areas
   d. All of the above


*The INJURY UPDATE is a report produced by the Injury Prevention Service, Oklahoma State Department of Health. Other issues of the INJURY UPDATE may be obtained from the Injury Prevention Service, Oklahoma State Department of Health, 1000 N.E. 10th Street, Oklahoma City, Oklahoma 73117-1299, 405/271-3430 or 1-800-522-0204 (in Oklahoma). INJURY UPDATES and other IPS information is also available at www.health.state.ok.us/program/injury.

Fire and burn injuries were the seventh leading cause of unintentional injury death in the United States in 1999 and 2000 accounting for less than 3,500 deaths per year, of which 80% were from residential fires. Residential fire deaths have decreased since 1981 when there were almost 5,000 deaths and ranked the fourth leading cause of death that year.[2] In 2000, approximately 379,500 residential fires killed about 3,420 people and injured another 17,400 people in the United States.[3]

Fire and burn injuries that resulted in hospitalization to a burn center or death were made a reportable condition in Oklahoma in November 1986. The Oklahoma State Department of Health has collected data on residential fire injuries and deaths since September 1987. Residential fire injuries were identified by review of medical records from the three burn centers in Oklahoma and reports from the Office of the Chief Medical Examiner. Data was supplemented with reports from the State Fire Marshal and local fire departments.

Between 1988 and 2001, there have been 6,803 Oklahomans hospitalized in a burn center or killed from a burn injury or smoke inhalation. Residential fire injuries accounted for 20% of those injuries, 1,354 persons. The case-fatality rate for residential fire injuries was 67%. 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 dies from their injuries.

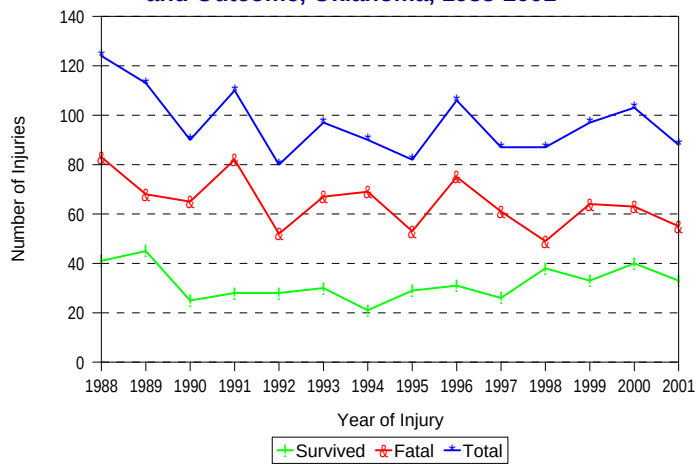
**Table 1. Residential Fire-Related Injuries by Age Group, Outcome, and Annual Rate, Oklahoma, 1988-2001**

| Age Group | Number of Injured Persons | Percent of Injured Persons | Annual Rate per 100,000 | Number of Fatal Injuries | Case Fatality Rate |
|---|---|---|---|---|---|
| 0-4 | 218 | 16% | 7 | 163 | 75 |
| 5-14 | 121 | 9% | 2 | 79 | 65 |
| 15-24 | 124 | 9% | 2 | 66 | 53 |
| 25-34 | 175 | 13% | 3 | 86 | 49 |
| 35-44 | 198 | 15% | 3 | 127 | 64 |
| 45-54 | 150 | 11% | 3 | 90 | 60 |
| 54-64 | 108 | 8% | 3 | 76 | 70 |
| 65+ | 260 | 19% | 4 | 219 | 84 |
| Total | 1266 | 100% | 3 | 906 | 67 |

Among persons of all ages, 62% of injuries occurred among males. African Americans had an annual burn injury rate (6.0 per 100,000 population) that was twice the rate of whites and Native Americans (2.7 and 2.3 per 100,000 population, respectively). Ninety-one percent of house fire injuries occurred in the injured persons own home (1237/1354).

Residential fire injuries have decreased 23% from the first 3-year period (1988-1990) compared to the last 3-year period (1999-2001) (Figure 1). There was an average of 97 injuries from residential fire per year.

**Figure 1. Number of Burn-Related Injuries by Year and Outcome, Oklahoma, 1988-2001**




Heating devices were the leading cause of residential fire injuries (21%). Wood burning stoves/heaters accounted for 22% of heating device burns followed by space heaters (15%) and propane stove heaters (11%). Gasoline accounted for 67% of the flammable substance injuries. Forty-four percent of injuries resulting from fireplay began with a lighter and

29% with matches. Various items such as fireworks, stoves and other open flame sources were attributed to the rest of the fireplay injuries. Figure 2 shows the causes of residential fire injuries in Oklahoma.

Smoke alarm status was known for 981 persons, of which 82% did not have a working smoke alarm at the time of the fire. Persons in a house fire were more than 2 times as likely to die if they did not have a smoke alarm as persons that did have a smoke alarm (OR = 2.5; 95% CI: 1.61-3.44). Sleep and smoke alarm status were known on 850 persons (Table 2). The odds of a person dying if they were asleep at the time of a fire and did not have a smoke alarm were 3 times greater than persons that were asleep and did have a smoke alarm (odds ratio = 3.28; 95% confidence intervals 1.82-5.91).

Over half (52%) of persons over the age of 14 who sustained burn injuries in a house fire and were tested for alcohol had a positive blood alcohol concentration (BAC) (Figure 3). Alcohol was a contributing factor in over 60% of the residential fire injuries to persons 25 to 64 years of age. Of those persons tested for BAC, 63% of males and 31% of females tested positive.

Of those admitted to a burn center, 26% (158/598) had less than a 10% total body surface area (TBSA) burn. Table 3 shows the relationship of severity of burn and outcome. Death among persons with TBSA burns on 80% to 100% of their body is 2.5 times higher than for persons with TBSA burns on less than 10% of their body.

**Figure 2. Leading Causes of Residential Fire Injuries, Oklahoma, 1988-2001**

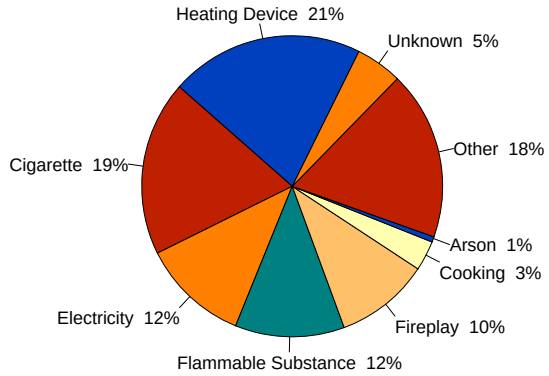
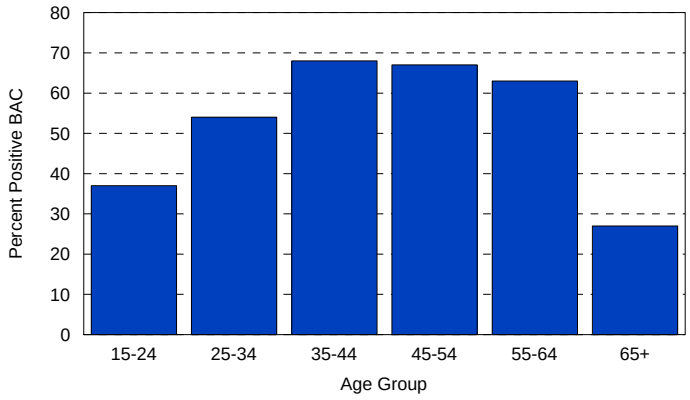



**Table 2. Residential Fire Injuries by Smoke Alarm Status, Sleep Status, and Outcome, Oklahoma, 1988-2001**

| Smoke Alarm Present | Asleep | | Awake | |
|---|---|---|---|---|
| | Fatal/Total | % | Fatal/Total | % |
| No | 305/395 | 77% | 177/306 | 58% |
| Yes | 32/63 | 51% | 40/86 | 47% |

**Figure 3. Residential Fire Injuries by Percent Positive Blood Alcohol Concentration and Age Group*, Oklahoma, 1988-2001**




* Includes persons over 14 years of age tested for blood alcohol

The Injury Prevention Service at the Oklahoma State Department of Health has been conducting smoke alarm programs in Oklahoma since 1990. From 1990 to 2001 over 33,000 smoke alarms have been distributed to over 32,000 homes in Oklahoma. Residential fire injury rates have decreased in smoke alarm communities. In one section of South Oklahoma City the residential fire annual injury rate from 1988 to 1990 was 14.4 per 100,000 population. A smoke alarm distribution campaign began in April of 1990 to reach the people that were at high risk for house fire injuries. After the installation program the rate of injury dropped to an average annual rate of 5.7 per 100,000 population, a 60% decrease in injury rate. Figure 4 shows the number of injuries for the south target area of Oklahoma City versus the rest of Oklahoma City for the years following the installation program.

## Smoke Alarm Saves:

A man in NW Oklahoma City woke to a smoke alarm going off. A furnace was started without realizing a rug was placed over the top of the grate. The rug caught fire and set the smoke alarm off. The man and his handicapped grandmother (90's) escaped the fire without injury. The alkaline alarm had been installed during canvassing.

A mother, father, and 2 girls escaped a house fire in Ponca City because of a program alarm installed by Ponca City Fire Department. The 3 and 4-year-old girls were playing with matches and caught the bed on fire. The alarm sounded and alerted the parents to the fire. All got out of the house without injury.

A family of three in Ardmore was alerted to a fire around 9:00 p.m. that was started by a droplight that had been left on in the attic. The house was undergoing remodeling. The family exited the home without injury.

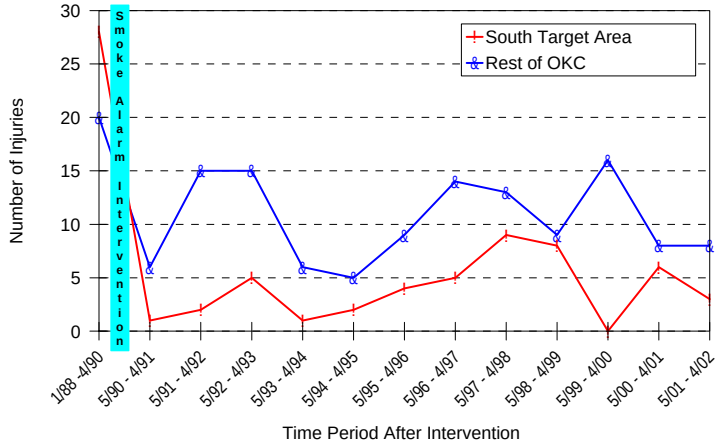
A woman in Muskogee began cooking dinner after returning from work. She started her meal, but went into the living room to rest and fell asleep on the couch. She awoke when the smoke alarm in her bedroom hallway began to sound. The kitchen was fully involved with fire and the house was filling with smoke when the fire department arrived. The woman credited the smoke alarm installed during canvassing for saving her life.

An Tulsa man was alerted to a chair fire in his living room by a program alarm that sounded. The fire was started because the upholstered chair was sitting too close to the fireplace.

**Table 3. Number of Residential Fire-Related Injuries by Percent TBSA Burned and Outcome, Oklahoma, 1988-2001**

| Percent of TBSA Burned | Survived | Fatal | Total Injuries (%) | Case-Fatality Rate |
|---|---|---|---|---|
| 1-9 | 146 | 12 | 158 (26%) | 8 |
| 10-19 | 112 | 9 | 121 (20%) | 7 |
| 20-39 | 90 | 24 | 114 (19%) | 21 |
| 40-59 | 31 | 25 | 56 (9%) | 45 |
| 60-79 | 13 | 36 | 49 (9%) | 73 |
| 80-100 | 2 | 30 | 32 (5%) | 94 |
| Smoke Inhalation or Unknown % | 54 | 14 | 68 (11%) | 21 |
| Total | 448 | 150 | 598 (100%) | 25 |

**Figure 4. Number of Injuries by Time Period after Smoke Alarm Intervention and Area, Oklahoma City**




## Quiz Answers:

1. A. Less than 4 minutes
   Fires go through a series of stages as they progress. As the fire gets larger and the stage progress, tenability (the ability for a person to remain unhurt in a fire area) decreases. During the incipient (initial) stage of a fire the temperature in a room is slightly over 100° F and the air is approximately 20% oxygen. As the fire grows and enters the Steady-State Phase (free-burning phase) smoke and gases rise to the top of the room and spread laterally across the ceiling. Oxygen is pulled into the room to fuel the fire and the temperature in the upper regions of the fire can exceed 1,300° F. The super-heated air at the top of the room will sear a person's lungs in one breath. If sufficient oxygen is available for the fire, flashover occurs (everything in the room becomes so hot it ignites). The average temperatures in the upper part of a room during flashover are 930° F to 1,300° F and oxygen levels in the room drop to 5% or less.[4] This can all occur in less than 4 minutes.[5]

2. D. All of the above
   The best way to survive a house fire is to get out of the home as quickly as possible. It takes less than 4 minutes for the temperature in a home to reach 1,300° F during a fire. Having smoke alarms installed on every level of the home and outside all sleeping areas will give you the early warning you need to get out of a house fire alive. Knowing two ways out of every room will give you options during a fire in case your primary exit is blocked. Developing a home escape plan with your family will let everyone in the family know what their job is during a fire. Practicing the escape plan will increase your chances of getting out quickly and safely.

3. A. Once a month
   All smoke alarms should be tested once a month to ensure they are working properly. A smoke alarm can increase your chances of surviving a house fire by more than 2 times.

4. B. Once a year
   If your smoke alarm is operating with an alkaline battery then follow this simple rule: Change your clocks; Change your battery. Smoke alarms are constantly on and working and so the alkaline battery needs to be tested monthly and changed yearly. When you change your clocks for Daylight Savings Time then you know it is time to change your alkaline battery in your smoke alarm.

5. C. On the floor about 3-feet from anything that burns
   Heating devices are the number one cause of house fires in Oklahoma. They are very useful in supplying added heat when needed but there are some rules to follow when using any type of heating device: 1) place heating devices 3-feet away from combustible items including yourself, 2) never leave a space heater or similar heating device unattended (turn them off when you leave a room or go to sleep), and 3) always check electrical cords for damage before use.

6. D. All of the above
   House fire injuries can affect everyone, but house fires disproportionately affect some populations. Children under the age of 5 and adults over 65 have the highest rates of injury. This could be due to many reasons, some of which could be mobility and cognitive issues. Persons living in manufactured housing, like mobile homes, have higher rates of injury than persons in houses or apartments. House fires affect people that live in rural areas more than persons in urban areas. Further studies may show why some of these discrepancies occur and point to ways of fixing the problems.

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3. Karter MJ Jr. *Fire Loss in the Unites States During 2000.* NFPA, Quincy, MA; 2001.
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5. Putorti Jr, AD and McElroy, J. *Full scale house fire experiment for InterFIRE VR.* http://www.interfire.com/features/fire_experiment.htm. Nov 1999.

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