

Can Child Deaths Be Prevented? The Arizona Child Fatality Review Program Experience

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ABSTRACT. *Objective.* To determine the causes and preventability of child deaths; to assess the accuracy of death certificate information; and to assess the number of child abuse deaths that are misdiagnosed as deaths attributable to natural or accidental causes.

Methods. Analysis of deaths of children <18 years old that occurred between 1995–1999 using the data collected by the Arizona Child Fatality Review Program (ACFRP).

Results. From 1995–1999, local multidisciplinary child fatality review teams (CFRTs) have reviewed 95% of all deaths of children <18 years old in Arizona. Each team has access to the child's death certificate, autopsy report, hospital records, child protective services records, law enforcement reports, and any other relevant documents that provide insight into the cause and preventability of a child's death. After reviewing these documents, the team determines the cause of death, its preventability, and the accuracy of the death certificate. The ACFRP defines a child's death as preventable if an individual or the community could reasonably have done something that would have changed the circumstances that led to the child's death. The ACFRP determined that 29% (1416/4806) of these deaths could have been prevented, and preventability increased with the age of the child. Only 5% (81/1781) of neonatal deaths were considered preventable, whereas the deaths of 38% of all children older than 28 days were considered preventable. By 9 years of age, the majority of child deaths (56%) were considered preventable. Deaths attributable to medical conditions were far less likely to be considered preventable than deaths attributable to unintentional injuries. Although 62% of all deaths in Arizona during the 5-year period were attributable to medical conditions, only 8% (253/2983) of these deaths were considered preventable. In contrast, 91% (852/934) of the deaths attributable to unintentional injuries were considered preventable. Motor vehicle crashes accounted for 634 of the deaths resulting from injuries, and drowning accounted for 187 deaths. Motor vehicle crashes were the leading cause of death for all children in Arizona over 1 year of age. Only 18% of child passengers and 3% of adolescent drivers who died were known to be appropriately restrained. The typical drowning victim was a young child who drowned in the family's backyard pool. Indeed, 70% (131/187) of the drowning victims were <5 years old, and 62% (81/131) of these children died in a backyard pool.

Supervision of the child and pool fencing could have prevented 90% of these deaths.

Most deaths attributable to medical conditions occurred in the first year of life. Prematurity was the most common medical condition (1036 deaths) followed by congenital anomalies (662 deaths) and infectious diseases (470 deaths). Some of the reasons why CFRTs believed a medical death was preventable included inadequate emergency medical services, poor continuity of care, and delay in seeking care because of lack of health insurance. There were 4 deaths resulting from infections that were vaccine-preventable.

There were 263 deaths attributable to sudden infant death syndrome. Only 38 of these infants were found lying on their back; 35 were found lying on their side. The death rate from sudden infant death syndrome decreased from 1.1 per 1000 infants <1 year of age in 1995 to 0.5 in 1999. There were 33 deaths that the CFRTs concluded were attributable to unsafe sleeping arrangements that resulted in unintentional suffocation.

From 1995–1999, 317 Arizona children died from gun shot wounds. Most of these deaths were homicides (175) or suicides (109). All suicide deaths occurred in children >9 years old, and 77% of these children were >14 years old. The typical suicide victim was male (83%) and used a gun (70%) to kill himself.

After review by the CFRTs, it was determined that 5 of the 67 child abuse deaths were misdiagnosed as attributable to natural or accidental causes on the death certificate. In 3 of these 5 cases, the child was in a persistent vegetative state and died many years after the episode of child abuse. Although inaction or inappropriate action by Child Protective Services (CPS) is often thought to be the cause of child abuse deaths, the ACFRP determined that in 79% of child abuse deaths, there had been no previous CPS involvement with the child's family. Although 61% of child abuse deaths were considered to be preventable, much of the responsibility for preventing these deaths rests with community members (eg, relatives, neighbors) who were aware of the abuse but failed to report the family to CPS.

The CFRTs, who had received training in the proper completion of death certificates, reported that the cause of death was incorrect on 13% of all death certificates and in 16 cases, the CFRTs disagreed with the medical examiner on the manner of death (eg, natural, accidental, undetermined). Because CFRTs have access to additional information that may not have been available to the physician who completes a child's death certificate, CFRTs may be able to more accurately determine the cause and manner of death than the physician who completed the death certificate.

Conclusions. Arizona's child death rate is above the national average (82.16/100 000), but the ACFRP determined that many of these deaths could have been prevented by using known prevention strategies (eg, child safety restraints, pool fencing). Most child mortality data

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PEDIATRICS (ISSN 0031 4005). Copyright © 2002 by the American Academy of Pediatrics.

are based on death certificate information that often is incorrect and cannot be used to assess preventability. Although most states have child fatality review programs that review suspected child abuse deaths, <3% of all preventable deaths in Arizona were attributable to child abuse. If all child deaths in the United States were reviewed from a prevention/needs assessment perspective, targeted and data-driven recommendations for prevention could be developed for each community, and potentially 38% of all child deaths that occur after the first month of life could be prevented. The ACFRP is an excellent example of a statewide system with a public health focus. To assist other states in developing similar programs, national support is needed. The establishment of a public health focused federally funded national program would provide us with the opportunity to standardize data collection among states and better utilize this data at a national level. *Pediatrics* 2002;110(1). URL: <http://www.pediatrics.org/cgi/content/full/110/1/e11>; *child abuse, death certificate, motor vehicle crash, prevention, drowning, child fatality review, gun-related deaths, sudden infant death syndrome, suicide, homicide, public health.*

ABBREVIATIONS. CFRT, child fatality review teams; ACFRP, Arizona State Child Fatality Review Program; SIDS, sudden infant death syndrome; MVC, motor vehicle crash; CPS, child protective services; GSW, gunshot wound.

Child fatality review teams (CFRTs) were initially developed in the United States over 20 years ago because of concerns about the underreporting of child abuse deaths and the lack of communication between child welfare agencies.¹⁻³ Although CFRTs have been developed in most states, few programs examine all child fatalities within a region in an attempt to identify preventable causes of child mortality. Since 1994, the Arizona State Child Fatality Review Program (ACFRP) has systematically reviewed all deaths of children <18 years old and thus has been able to assess the causes, preventability, and epidemiology of pediatric deaths in Arizona. Now in the sixth year of data collection, the ACFRP has accumulated a wealth of information. This report summarizes the ACFRP findings during its first 5 full years of data collection from 1995-1999.

METHODS

The ACFRP was created by state statute in 1993 (ARS 36-342, 36-350-4) and began data collection in 1994. A statewide team was mandated by the legislature to provide oversight of the program, develop the data collection system, and produce an annual report summarizing their findings. The state team also approves the development of each local team that is responsible for reviewing the child deaths in their own community and provides additional support and training for local team members as needed. By statute, the state team includes representatives of the Arizona Chapter of the American Academy of Pediatrics, Indian Health Service, law enforcement, prosecuting attorney's office, county health departments, military advocacy program, child protective services (CPS), American Indian communities, and the county medical examiners' office.

The statute also outlines the composition of each local team. These teams must include a local representative from CPS, the county medical examiner's office, county health department, law enforcement, and county prosecuting attorney's office. Other team members include a pediatrician or family physician, psychiatrist or psychologist, a domestic violence specialist, and a parent. When a child dies in Arizona, a copy of their death certificate is sent to

the ACFRP. The death certificate is then forwarded to a local CFRT in the child's county of residence. The local team then requests the child's autopsy report, hospital records, CPS records, law enforcement reports, and any other relevant documents that provide insight into the child's death. If the child was <1 year of age at the time of the death, the birth certificate is also reviewed. The enabling legislation requires that hospitals and state agencies release this information to the ACFRP's local teams. Team members are required to maintain confidentiality and are prohibited from contacting the child's family. The relevant agencies now cooperate fully with the ACFRP's request for records and, in most cases, all relevant information is available for the team's review.

After reviewing all documents, the local team makes an assessment of the preventability of each child's death and completes a standardized data sheet (available at <http://www.hs.state.az.us/cfhs/azcf/publications.htm>) that includes extensive information regarding the circumstances surrounding the death. The ACFRP defines a child's death as preventable if an individual or the community could reasonably have done something that would have changed the circumstances that led to the child's death. If the local CFRT members cannot come to a consensus regarding the preventability of a child's death, the preventability is listed as unknown. The local CFRTs review deaths throughout the year and must submit them to the state team by August 15 each year. This deadline for completion of reviews is necessary so that the state team can utilize the local team data to prepare an annual report that is published in November of each year. If a CFRT has not received sufficient information to complete a review by the August 15 deadline, the death will not be reviewed. The state team prepares an annual report that summarizes the local CFRTs' findings and makes recommendations for preventing future deaths. The most recent annual report is available at <http://www.hs.state.az.us/cfhs/azcf/index.htm>.

RESULTS

From 1995-1999, the ACFRP reviewed 4806 child deaths. This represents ~95% of all deaths of children <18 years old that occurred during this period. The local CFRTs determined that 1416 (29%) of the deaths were preventable. In 202 cases, the local teams felt that they could not assess preventability. Most of these cases (108/202) occurred in 1995. The percentage of deaths that were considered to be preventable each year ranged from 27% to 32%.

Only 5% (81/1781) of neonatal deaths were considered preventable. In contrast, the deaths of 38% of all children older than 28 days were considered preventable, and the percent considered preventable increased with age. For infants >28 days but <1 year of age, 26% (249/955) of the deaths were preventable. In contrast, 33% (466/1421) of deaths in children >1 and <9 years old and 56% (620/1113) of the deaths in children over 9 years old were preventable.

The 2 most common causes of neonatal death were prematurity (990 deaths) and congenital anomalies (482 deaths). For children >28 days but <1 year, the most common cause of death was sudden infant death syndrome (SIDS; 236 deaths) closely followed by infectious diseases (233 deaths). The third most common cause was congenital anomalies (180 children). For all children over 1 year of age, the most common cause of death was motor vehicle crashes (MVCs). The 3 most common causes of death for each age group is listed in Table 1.

For this report, certain types of deaths have been grouped into larger categories including MVCs, drowning, suicide, child abuse, homicide, unexpected infant deaths, other (non-MVC) unintentional injuries, and medical conditions. When a death could have been placed in either of 2 categories (eg, child

TABLE 1. Leading Causes of Death Versus Age

Age	Cause of Death	Number of Deaths
<28 d	Prematurity	990
	Congenital anomalies	482
	Perinatal conditions	95
28 d-1 y	SIDS	236
	Infectious disease	233
1-4 y	Congenital anomalies	180
	MVCs	133
	Drowning	116
5-9 y	Infectious disease	78
	MVCs	95
	Neoplastic diseases	49
10-14 y	Infectious disease	31
	MVCs	126
	Neoplastic disease	36
15-17 y	Homicide	34
	MVCs	227
	Homicide	141
	Suicide	112

abuse and homicide), it is reported only in the 1 category that most reflects the underlying manner or intention. We have also analyzed separately all gun-related deaths.

MVCs

The leading category of preventable deaths each year has been MVCs. This category includes children and adolescents who were passengers, drivers, or pedestrians. Motor vehicles include automobiles, trucks, motorcycles, all-terrain vehicles, airplanes, motorized boats/jet skis, and trains. From 1995-1999, 634 children died because of motor vehicle injury. Only 6% (41/634) of these deaths involved children <1 year of age, and 57% (361/634) of the children who died from MVCs were over 9 years old. The ACFRP determined that 568 (90%) of the MVC deaths could have been prevented. Although the death rate for Arizona children (birth to 17 years old) attributable to MVCs has decreased from 12.9/100 000 in 1995 to 8.2/100 000 in 1999, the percentage of deaths that the ACFRP felt were preventable increased from 85.6% in 1995 to 97.2% in 1999.

Of the 341 children who died while riding in a motor vehicle, 224 (66%) were not properly restrained, 63 (18%) were appropriately restrained, and restraint use data were unavailable for 54 (16%). Among 89 adolescent drivers who died, at least 38 of them (43%) were not wearing seat belts, 3 (3%) were known to be wearing a seat belt, and in the remaining 48 (54%), the use of restraints is unknown. Speed, road conditions, and impairment of the driver because of alcohol or drugs also were reviewed. For MVC deaths in which the child/adolescent was either a driver or a passenger, the local teams reported that alcohol and/or other drugs were a contributing factor in 281 of these MVC deaths. However, for many cases, use of alcohol or drugs by the driver was unknown.

Since 1995, 21 children died because of injuries that occurred while riding in the back of a pickup truck. All of these deaths were considered to be preventable. Ten children died while riding on all-terrain vehicles. Only 1 of these children was wearing a

helmet, and the teams felt that all of these deaths were preventable. Seven children died while riding on motorcycles; only 1 of these children was wearing a helmet and all of these deaths were considered preventable. Six children died while riding in motorized watercraft; 4 were preventable and 2 were unknown. Pedestrian MVCs were responsible for 138 deaths, and 109 (81%) of these deaths were preventable. Educational programs, better supervision of a child, and use of crosswalks were some of the ways in which these pedestrian deaths could have been prevented.

Drowning Deaths

Perhaps because of our warm weather and ubiquitous backyard swimming pools, drowning is a common cause of child death in Arizona. From 1995-1999, 187 Arizona children drowned. The most common scenario for drowning deaths in Arizona is a young boy who is left unsupervised and drowns in the family's backyard pool. Indeed, 131 (70%) of the 187 children who drowned were <5 years old; 81 (61%) of these 131 children died in a private pool. Eighty-five boys versus 46 girls <5 years old drowned.

The ACFRP database includes questions regarding pool fencing, gates, and gate locks, as well as supervision of the child. In most communities, an accident report that is completed by first responders includes this information. There were only 4 deaths that occurred in backyard pools in which it was known that there was an adequate pool fence that had a properly functioning locked gate. Among the other children <5 years old, drowning occurred in canals (12), bathtubs (9), buckets (6), lakes/rivers (5), and public pools (2). Despite an increasing population, the number of drowning deaths has steadily declined from 43 deaths in 1995 to 22 deaths in 1999. Regardless of the age of the child or the location of the drowning, the ACFRP felt that 161 (86%) were preventable. Every drowning that occurred in a bathtub, bucket, or canal was considered preventable, and 82 (90%) of 91 drownings that occurred in backyard pools were considered preventable.

Child Abuse

Child abuse deaths were defined as deaths from neglect or types of intentional injury traditionally associated with child abuse (eg, shaking, blunt trauma, suffocation, drowning, and poisoning). Because deaths from intentional gunshot wound (GSW) or stabbing are usually investigated and prosecuted as homicides, these deaths were placed in the homicide rather than child abuse category. Two deaths attributable to restraint asphyxia, 3 deaths resulting from setting a child on fire, and 1 death that occurred when a mother jumped off a building with her child were also considered homicides. Using this definition, there were 67 child abuse deaths in the 5-year period. Twenty-five of these children were <1 year old, 29 were 1 to 4 years old, and 13 were over 4 years old. The cause of death varied with age (Table 2). Among infants, the most common cause of death was shaken infant syndrome (11 deaths), followed by

TABLE 2. Cause of Child Abuse Deaths Versus Age

Age (Years)	Cause of Death	Number of Deaths
<1	Shaken baby syndrome	11
	Blunt trauma	8
	Suffocation	4
	Other	3
1-4	Blunt trauma	20
	Shaken baby syndrome	4
	Suffocation	3
	Other	2
5-18	Blunt trauma	10
	Other	3

blunt force trauma (8 deaths) and intentional suffocation (4 deaths). The other 3 deaths were attributable to medical neglect, intentional drug overdose, and intentional drowning. Among the 29 children 1 to 4 years old, the most common cause of death was blunt force trauma (20 deaths), followed by shaking (4 deaths) and suffocation (3 deaths). The remaining 2 deaths were attributable to neglect. Among children 5 years old or older, the most common cause of death was also blunt trauma (10 of 13 deaths). The other 3 deaths were attributable to shaking, suffocation, and poisoning. In 6 of these cases, the child had been abused as an infant or toddler and was in a persistent vegetative state for many years before death.

The most common perpetrators were the father (14 deaths), mother's boyfriend (14 deaths), and mother (12 deaths). Two children died as a result of injuries from child care providers and 2 as a result of injuries from other family caretakers. In the remainder of the deaths, the perpetrator could not be determined from the records reviewed by the team.

The CFRTs believed that 61% (42/67) of the child abuse deaths were preventable. Arizona CPS had been involved in only 21% (14/67) of these cases before the child's fatal injuries or neglect. In 2 additional cases, an out-of-state CPS agency had been involved but had not reported the family to Arizona CPS before the child's death. In 2 cases, the ACFRP felt that medical personnel who had failed to recognize suspicious injuries could have prevented the death.

Homicides

There were 201 homicides over the 5-year period. Most of these deaths occurred in adolescents, but there were 36 deaths in children <13 years old. Eighty-seven percent (175/201) of these deaths were from a GSW. In young children, the assailant was usually a parent or other family member, including 8 children who were murdered by their father and 6 by their mother. Only 3 children were murdered by a stranger. The CFRTs felt that 37% (76/201) of these deaths could have been prevented. Prevention strategies include decreasing children's access to guns and improved parental supervision.

Suicide Deaths

During the 5-year period of this study, there were 156 self-inflicted deaths (suicides). The typical sui-

cide victim was an adolescent male who shot himself with a handgun. Indeed, all of these deaths occurred in children and adolescents >9 years old and 120 of the deaths (77%) were in adolescents 15 to 17 years old. Males outnumbered females 129 to 27. In 109 (70%) of the 156 deaths, the suicides were attributable to GSW, 32 were attributable to hanging or suffocation, and only 4 were attributable to ingestion. The CFRTs believed that 107 (69%) of 156 suicide deaths were preventable. Strategies for prevention include decreasing children's access to guns, better availability of mental health services, and education of parents and teachers regarding the signs and symptoms of adolescent depression.

Unexpected Infant Death

By Arizona statute, an autopsy protocol must be followed in all unexpected infant deaths. This protocol includes metabolic screening, toxicological screening, and a long bone survey. A scene investigation is also recommended. Our ACFRP assesses whether the protocol has been followed and communicates with those responsible for completing the protocol when deficiencies are noted. Part of the scene investigation includes an assessment of the sleep arrangements, bedding, and the infant's sleep position at the time of death. Because of this protocol, a substantial number of deaths initially thought to be attributable to SIDS are found to be from other causes including suffocation or more rarely abuse.

After review of the medical records, autopsy reports, and scene investigation report, the CFRTs determined that 263 of the unexpected infant deaths were attributable to SIDS. The death rate from SIDS decreased from 1.1 per 1000 infants <1 year of age in 1995 to 0.5 in 1999. Most infants (235/263) were 6 months old or less. The infant's sleep position was recorded in 177 of these deaths. In only 38 of these deaths the infant was found on their back; 104 were on their abdomen and 35 were found lying on their side. The infant's sleep position was not recorded in 82 cases. Determining whether a SIDS death is preventable is difficult. Although we know that putting a infant to sleep on their back can decrease the risk of SIDS, it is not certain if supine sleeping position could have prevented all of these deaths. However, 45% (119) of the SIDS deaths were considered potentially preventable based on the presence of known risk factors. There were 33 unexpected infant deaths that the CFRTs concluded were resulting from unsafe sleeping arrangements that resulted in unintentional suffocation. Twenty-one of these infants were <3 months old. In 10 cases, the infant was found wedged between a mattress and headboard or crib rail. In 13 cases, asphyxiation attributable to overlaying was the cause of death. Inappropriate bedding (eg, soft cushions) was responsible for 4 deaths, and plastic bags that had been left in the bed were the cause of 3 deaths. All of these deaths attributable to unsafe sleep arrangements were believed to be preventable.

Other Unintentional Injuries

The death rate for unintentional injuries excluding MVCs decreased from 9.7 per 100 000 children <18 years old in 1995 to 5.1 in 1999. In addition to MVCs and drowning, other categories of unintentional injuries included smoke inhalation/burns (35 deaths), bicycle injuries (31 deaths), GSWs (22 deaths), foreign body aspiration/choking (12 deaths), and poisonings (11 deaths). Most of these deaths were preventable (Table 3). There were also deaths attributable to heat exposure, horse-related injuries, electrocution, strangulation, and head injuries (eg, furniture falling on child). Twenty-four of the 35 deaths attributable to unintentional smoke inhalation/burns were the result of house fires. Unfortunately, only 14 scene investigation reports included information on smoke alarms, and only 1 of these homes had a functioning smoke alarm.

The CFRTs believed that 28 (90%) of the 31 deaths resulting from bicycle injuries were preventable. In 19 (61%) of these deaths, the child was not wearing a helmet; in 3 cases the child was wearing a helmet, and in 9 cases it was not known if a helmet was worn. There were 22 deaths attributable to unintentional GSWs. The CFRTs felt that 18 (82%) of 22 deaths were preventable. Of the 12 children who died because of foreign body aspiration/choking, 7 had choked on food and 2 had choked on pills. Balloons were responsible for 2 of the deaths, and 1 child had choked on a piece of tape. The CFRTs felt that 9 (75%) of 12 of these deaths were preventable.

Nine of the 11 poisoning deaths occurred in adolescents, and all of these 9 deaths were associated with the abuse of alcohol or other drugs. Abused substances included alcohol (3 deaths), inhalants (3 deaths), and narcotics (3 deaths). One 5-year-old died of an acetaminophen overdose, and a 3-year-old died because of methadone poisoning.

Deaths Attributable to Medical Conditions

There were 2983 deaths attributable to medical conditions, and 2293 (77%) of these deaths occurred in the first year of life. Prematurity was the most common medical condition (1036 deaths), followed by congenital anomalies (662 deaths) and infectious diseases (470 deaths). Although 62% of child deaths in Arizona are attributable to medical causes, only 8% (253/2983) of these deaths were believed to be preventable. However, after MVC deaths, medical conditions were the second most common cause of preventable deaths (Table 4). The reasons why the CFRTs believed a medical death was preventable

TABLE 3. Deaths Attributable to Unintentional Injuries

Cause of Death	Number of Deaths	Preventable Deaths (%)
MVCs	634	568 (90%)
Drowning	187	161 (86%)
Smoke inhalation/burns	35	24 (70%)
Suffocation	33	33 (100%)
Bicycle injuries	31	28 (90%)
GSWs	22	18 (82%)
Foreign body aspiration/choking	12	9 (75%)
Poisoning	11	11 (100%)

TABLE 4. Major Categories of Preventable Deaths

Category of Death	Total Number of Deaths	Preventable Deaths
MVCs	634	568
Medical conditions	2983	253
Drowning	187	161
Suicide	156	120
SIDS	263	119
Other unintentional injuries*	111	90
Homicide	201	76
Child abuse	67	41

* This category includes deaths attributable to bicycle injuries, burns/smoke inhalation, unintentional GSWs, choking, and poisoning.

included inadequate pediatric emergency medical services, poor continuity of care, delay in seeking medical care because of lack of health insurance, and inadequate prenatal care. There were 4 deaths from vaccine-preventable infections that the CFRT believed could have been prevented by immunizations.

Gun-Related Deaths

Guns were involved in 317 (6%) of all deaths during the 5-year period of our study. Because this one instrument was involved in 4 categories of death (homicide (175), suicide (109), unintentional injury (22), and undetermined manner (11)), we have reviewed these deaths within those categories and separately. The typical GSW victim was a male adolescent who was shot by a handgun. Indeed, 245 (77%) of the victims were male and 228 (72%) were 15 to 17 years old. Data on the type of gun used is incomplete, because this information is sometimes not included in law enforcement reports. However, most of these gun-related deaths (153) were attributable to handguns; 56 were attributable to a shotgun or rifle, and in 101 of these deaths, the type of gun used was not known. The CFRTs believed that 169 (55%) of these deaths attributable to GSWs were preventable. In only 8 of the 310 deaths was the gun known to be locked. In addition to gun locks, the ACFRP felt that decreasing children's access to guns and educating parents regarding the risks of keeping guns in the home when an adolescent is depressed could have prevented these deaths.

Death Certificate Accuracy

Each CFRT received training in the proper completion of death certificates. After reviewing all the information available to the CFRTs, team members were asked to assess the accuracy of each child's death certificate. The CFRTs determined that there were errors in the demographic data (eg, address, age, ethnicity) on 133 (3%) of 4806 death certificates and in the cause of death on 602 (13%) of 4806 death certificates. There were 16 deaths that the CFRT disagreed with the medical examiner on the manner of death (eg, natural, accidental, undetermined). Over the 5-year period, there were 5 deaths that the CFRT believed were attributable to child abuse, and the medical examiner had listed the cause of death as natural or accidental. However, in 3 of these 5 cases, the child had died in an institutional setting after

living for many years in a persistent vegetative state after a child abuse incident in early life.

DISCUSSION

The first child fatality teams were developed over 20 years ago because of concerns about the underreporting of child abuse deaths. These teams can provide community oversight of CPS agencies by assessing the involvement of CPS before a child's death. Teams also can determine the number of child abuse deaths that are misdiagnosed as deaths attributable to natural causes or unintentional injury. Fortunately, public and professional recognition of abuse has greatly improved in the past 2 decades, such that, in Arizona, we identified only 5 child abuse deaths that were initially misdiagnosed as deaths attributable to natural causes or unintentional injury. Although inaction or inappropriate action by CPS is often thought to be the cause of child abuse deaths, the ACFRP determined that in 79% of child abuse deaths, there had been no previous CPS involvement with the child's family. Although 61% of child abuse deaths were considered to be preventable, much of the responsibility for preventing these deaths rests with community members (eg, relatives, neighbors) who were aware of the abuse but failed to report the family to CPS. The CFRTs also noted that better communication between state CPS agencies potentially could have prevented 2 deaths.

The death of a child is a sentinel event that is a measure of a community's overall well-being. Most child mortality data are based on death certificate information. However, our ACFRP has found that death certificates frequently are not completed correctly and lack sufficient information to accurately determine the cause of death or its preventability. By reviewing additional information, including hospital records, medical examiner's reports, and scene investigation data, CFRTs can more accurately determine the cause of death. In addition, the ongoing assessment of the accuracy of death certificate data by CFRTs can be used to educate physicians on the proper completion of death certificates, thus decreasing errors in the future. Similarly, CFRTs can monitor the completeness of scene investigation reports and then take steps to improve their accuracy. For example, the ACFRP has worked closely with law enforcement agencies to improve the documentation of appropriate restraints in fatal MVCs and sleep position in unexpected infant deaths. Better death certification and scene investigation will lead to a more complete and precise database for epidemiologic analysis in the future.

Forty-nine states have established CFRTs. Twenty-eight states have both local and statewide teams. Nine have only local teams, and 12 have only state teams (R Webste, personal communication, October 2001). Unfortunately, many of these CFRTs are only able to review child abuse deaths or deaths that are unexplained or unexpected and thus suspicious for abuse. In addition, many states only review the deaths of infants or young children. Only 3% (41/1416) of all preventable deaths and 1% (67/4806) of all deaths identified by the ACFRP over a 5-year

period were attributable to abuse. Thus, limiting reviews to child abuse deaths will miss the opportunity to identify and develop prevention/intervention programs for the overwhelming majority of preventable deaths in a community.

The mission of the ACFRP is to reduce child fatalities through community-based prevention education and data-driven recommendations for legislation and public policy. Because local teams review deaths, prevention strategies can be developed that best meet the needs of the local community. For example, because of the high number of canal drownings in agricultural areas of our state, CFRTs in rural Arizona counties initiated public education campaigns in their counties to increase parent's awareness of the dangers associated with irrigation canals. In contrast, drowning prevention programs in urban areas need to emphasize the importance of pool fencing and parental supervision.

Accurate data collection and annual reporting also can be used to assess the success or failure of educational campaigns and legislative action. Although collecting and reviewing child mortality data has traditionally been the responsibility of public health departments, the ACFRP adds a multidisciplinary approach to this analysis. The child deaths are more than just numbers, because team members can "put a face" on each case. Thus, team members are highly motivated to develop prevention programs and collaborate with public health departments in disseminating information and enlisting community support for prevention campaigns and legislative action.

Because funding for injury prevention activities is limited, CFRTs also can help communities decide where to invest their prevention dollars. In Arizona, as in other states, preventing deaths attributable to MVCs should be a major target of prevention campaigns, because MVCs account for 40% (568/1416) of preventable deaths and 13% (634/4806) of all deaths annually (Table 4). Based on our data, the ACFRP has supported increased enforcement and community education regarding Arizona's child safety restraint laws. In 1998, the team supported legislation establishing a graduated driver's license program for teens. The CFRT data also can be used to identify special population groups that need targeted prevention programs. For example, our ACFRP has recognized for many years that unintentional injury deaths and suicides are more common in our Native American communities, whereas deaths attributable to GSWs occur more frequently in our Hispanic communities.

It is difficult to compare the ACFRP preventability data with other states because most CFRTs do not systematically assess preventability for all child deaths in a peer review manner. In Philadelphia, however, a CFRT was established to review all deaths to persons 21 years old or younger and assess preventability. This team reviewed 607 deaths that occurred in 1995 and determined that 37.2% of the deaths reviewed were preventable.⁴ The Philadelphia CFRT used a definition of preventable death that is similar to Arizona's. Their percentage of deaths considered preventable was slightly higher

than Arizona's but the Philadelphia team included 18 to 21 year olds in their review. Because this age group is most likely to die from accidents, suicides, or homicides, it would be expected that including this age group would increase the number of preventable deaths.

Arizona's child death rate is above the national average (82.16/100 000) but our data indicated that a substantial number of these deaths could be prevented, especially deaths resulting from injuries. Many of the leading categories of preventable deaths have recognized prevention procedures (eg, child safety restraints, pool fencing). A lesson to be learned from this data is that although new prevention strategies often receive the most public attention, we need to emphasize the use and enforcement of the already well-known strategies, including continuing anticipatory guidance at health supervision visits, public safety campaigns, and enforcement of existing laws.

Suicide and homicide are now major public health concerns, and our data confirm that these are significant categories of preventable deaths. Unfortunately, effective strategies for the prevention of these deaths are complex and difficult. Early recognition of depression, better access to mental health services, and elimination of guns from the homes of troubled youth are some of the strategies that could be used to reduce the number of suicides. Homicides frequently occur in the home. The perpetrator is usually not a stranger and is often a family member or friend. For adolescents, gang membership and easy access to guns are significant risk factors. Whether effective early childhood intervention, school-based violence prevention, or domestic violence prevention programs can effectively reduce the number of homicides is not yet known.

Although only 8% of the deaths attributable to medical conditions were considered preventable, this is still the second most common category of preventable deaths, because over 60% of all child deaths are attributable to medical conditions. Community strategies to prevent these deaths include better access to medical care and better training of emergency medical personnel in the diagnosis and management of pediatric patients.

The ACFRP has limited funding and depends on a dedicated group of volunteers that donate over 4000 hours annually. Other states have also struggled to find adequate funding for their teams. Many states that would like to expand their CFRTs to include a more comprehensive review of all child deaths lack technical expertise as well. A developmental objective in *Healthy People 2010* is that state CFRTs should be extended to deaths attributable to external causes

for children 14 and under and that states with adequate resource are encouraged to expand their reviews to all causes of death for all children 18 years and under.⁵ It is also stated that the goal for CFRTs should be the prevention of child fatalities and that it is not helpful to simply gather data without also making recommendations for prevention.

The ACFRP is an excellent example of a statewide system with a public health focus. To assist other states in developing similar programs, national support is needed. The establishment of a federally funded national program would provide us with the opportunity to standardize data collection among states and better utilize the CFRT data at a national level. A federally supported National Child Mortality and Morbidity Program also could assist states in developing appropriate authorizing legislation, identifying funding sources and developing protocols. Such a program could also serve as an information resource where the child fatality data from each state could be stored and made available to researchers and child advocacy groups. This national initiative could be patterned after the National Fetal-Infant Mortality Review Program at the American College of Obstetrics and Gynecology that is supported by the Maternal and Child Health Bureau. The child abuse component of a national mortality and morbidity program has been developed by the Inter-Agency Council on Child Abuse and Neglect, but the review of all child deaths from a prevention/needs assessment perspective is far less developed nationally and would benefit from a federal mandate and fiscal support. This could be accomplished by a partnership between the Maternal and Child Health Bureau and the American Academy of Pediatrics in a manner similar to the National Fetal-Infant Mortality Review Program model. The importance of data-driven recommendations and follow-up cannot be overemphasized. The ACFRP experience serves as a prime example of the power of this multidisciplinary process.

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