
INJURY AND VIOLENCE PREVENTION IN RURAL AREAS: A LITERATURE REVIEW

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SCOPE OF PROBLEM

- Age-adjusted injury and unintentional injury death rates are higher in rural areas than urban areas.^{1, 2}
- Unintentional injuries are the fifth leading cause of death and are more prevalent in rural areas.³
- Motor vehicle deaths and occupational injuries are higher in rural areas.²
- The 40 percent of agricultural work-related fatalities accounted for by minors far outweighs the small percentage of minors in agriculture, eight percent.^{4, 5}

GOALS AND OBJECTIVES

Injuries represent a significant cause of morbidity and mortality for children, adults, and the elderly. Steps to address this complex problem are articulated in the Healthy People 2010 (HP2010) injury and violence prevention goal and associated objectives. Specifically, the HP2010 goal for this focus area is to reduce injuries, disabilities, and deaths due to unintentional injuries.⁶ For the purposes of this review, the following Healthy People 2010 objectives are addressed:⁶

- 15.1. Reduce hospitalization for nonfatal head injuries.
- 15.3. Reduce firearm-related deaths.
- 15.4. Reduce the proportion of persons living in homes with firearms that are loaded and unlocked.
- 15.5. Reduce nonfatal firearm-related injuries.
- 15.7. Reduce nonfatal poisonings.
- 15.8. Reduce deaths caused by poisonings.
- 15.13. Reduce deaths from unintentional injuries.
- 15.14. Reduce nonfatal unintentional injuries.

- 15.15. Reduce deaths caused by motor vehicle crashes.
- 15.17. Reduce nonfatal injuries from motor vehicle crashes.
- 15.19. Increase use of safety belts.
- 15.27. Reduce deaths from falls.
- 15.29. Reduce drownings.
- 15.32. Reduce homicides.
- 15.33. Reduce maltreatment and maltreatment fatalities of children.
- 15.34. Reduce the rate of physical assault by intimate partners.
- 15.36. Reduce sexual assaults.
- 15.38. Reduce physical fighting among adolescents.
- 20.1. Reduce work-related injury deaths.
- 20.2. Reduce work-related injuries.

Nationally, injury data are collected by three main categories—unintentional injuries, homicide, and suicide. Unintentional injuries were the fifth leading cause of death overall in 2001.³ Age-adjusted injury and unintentional injury death rates are higher in rural areas than urban areas.^{1, 2} The leading cause of unintentional injuries was deaths due to motor vehicles—a rate that is higher in rural areas than urban areas.

Occupational injuries are another significant source of unintentional injuries, and the agriculture,

mining, forestry, and fishing industries have some of the highest occupational mortality rates.^{2, 17, 18, 23} Firearm fatalities, drowning, falls, burns, and

Unintentional injuries were the fifth leading cause of death overall in 2001.³

poisonings are significant causes of unintentional injuries as well. Intentional injuries such as those caused by youth violence, homicide, and family and intimate partner violence are more prevalent in urban areas. Since the underlying factor in suicide is mental health, it is included in the Rural Healthy People 2010 chapters addressing mental health. While mortality data are used mainly to report on youth violence and homicide, morbidity data are frequently used to report on family and intimate partner violence. Victims of domestic violence are more likely to attempt suicide and to experience mental health problems. Overall, however, morbidity data are incomplete and stand out as one of the leading areas for surveillance improvement.

Throughout the literature review and in the community models highlighted, the need to recognize the diversity of rural areas is apparent—the problems are not common to all regions, and one solution will not work for all rural areas. Currently, this is being addressed by the National Institute for Occupational Safety and Health (NIOSH) Centers for Agricultural Disease and Injury Research, Education, and Prevention and through the recent classifications of nonmetropolitan areas into micropolitan and noncore counties by the Office of Management and Budget (OMB).⁹⁰

IDENTIFIED BY PEOPLE LIVING IN RURAL AREAS AS A HIGH PRIORITY HEALTH ISSUE FOR THEM

The Rural Healthy People 2010 survey found accidental injury and violence was tied for 13th rank as a rural health priority by state and local rural health leaders in considering the 28 Healthy People 2010 focus areas.⁷ Among four groups of rural health leaders, this topic was significantly more likely to be identified as a priority by state-level rural health leaders and, to a slightly lesser degree, by local public health agencies than by leaders of rural hospitals or health centers or clinics. There were no significant differences in rates of nomination across the four geographic regions of the country. Accidental injury and violence share the 13th rural health priority ranking with immunization and infectious diseases.

PREVALENCE AND DISPARITIES IN RURAL AREAS

To examine the wide scope of injury and violence, it is necessary to categorize injuries as intentional or unintentional. Although some areas do not divide clearly along these lines, the majority of injuries do. In addition to this broad categorization, each one is subdivided by the cause of injury. The scheme used in this literature review is one used by the World Health Organization's 2002 World Report on Violence and Health.⁸ In this context, *unintentional injury* includes injuries related to traffic (motor vehicle, safety belt use, and all-terrain vehicles), occupational and work related (focusing on agriculture, mining, forestry, and fishing), firearms, drowning, falls, burns, and poisonings. *Intentional injury* includes interpersonal violence (pertaining to youth, family, and intimate violence) and homicide.

Unintentional Injuries

Traffic Injuries

Deaths due to motor vehicle-related injuries are a leading cause of unintentional injuries. In 1999, the overall age-adjusted rate in the U.S. was 15.5 per 100,000.² Specifically, higher motor vehicle death rates are found in rural areas, particularly in the West and South.^{2,9} In 1994, rural counties had an unintentional motor vehicle death rate of 31.4 per 100,000, compared to a rate of 13.2 in metropolitan counties.² An analysis of data from the National Highway Traffic Safety Administration's Fatal Accident Reporting System (FARS) and the U.S.

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Census Bureau between 1977–1996 found the rural motor vehicle crash death rate (58.1 percent) was

higher than the urban rate (41.9 percent). The rural dead-at-scene rate (44.9 percent) was also higher than the urban rate (27.7 percent).⁹ A study of FARS data from four Midwestern states during 1986–1990 found death rates increased as population density decreased.¹⁰ It is necessary to mention the difficulty

in differentiating motor vehicle accidents from work-related motor vehicle accidents, which are discussed in a following section. It is also important to recognize the unclear distinction of accidents actually occurring to rural residents and urban visitors who happen to have an accident on rural roads. This may disproportionately and incorrectly classify a greater proportion of accidents as involving rural populations rather than urban populations.

Failure to use safety belts is an important factor in unintentional injuries and deaths.¹⁰ Farm residents are less (or have been found to be less) likely to regularly wear safety belts than residents in metropolitan areas.¹¹ Analysis of data from the 1994 Fatal Accident Reporting System on child restraint use among children zero to nine years old found safety belt use decreased in older children and also decreased as the number of passengers increased. Safety belt use was found to be less common in rural areas, in “older vehicles,” and in trucks.⁹¹

Use of all-terrain vehicles (ATVs) is an increasingly important factor in motor vehicle injuries and deaths. ATVs are “motorized, gasoline-powered vehicles, generally weighing 300–600 lbs intended for use by riders on off-road, non-paved terrain.”¹³ Rural residents, farmers, and men have been found more likely to have ridden an ATV in the last year.^{1, 11} While ATVs can be used on farms for work-related activities, they are commonly used for recreation, where more injuries occur.¹² A report by the U.S. Consumer Product Safety Commission (CPSC) of West Virginia regarding ATV-related deaths between 1985–1997 found the majority of deaths were due to head or neck injuries, mainly from collisions and overturns.¹³

Children are frequently victims of ATV-related injuries. Children less than 16 years of age account for approximately 36 percent of ATV-related deaths in the United States.^{13, 14} The majority of ATV-related deaths among children are due to head injuries, while nonfatal injuries are due to head and spinal trauma as well as abdominal injuries.¹² Data may suggest the possibility of misclassification of ATV-

related injuries to rural populations since a significant proportion of accidents are recreation-related and occur among youth less than 16 years of age who may be urban residents traveling to rural areas solely for recreational purposes.

Occupational Injuries

Unintentional injuries also occur in occupational settings. The overall 2001 U.S. occupational fatality rate of 4.3 per 100,000 did not change from the previous year (after excluding the September 11, 2001 fatalities).¹⁵ The highest occupational fatality rates occur among workers in mining, agriculture, forestry, and fishing industries.^{2, 16-20} Workers in these sectors also have the highest rates of machine-related deaths and motor vehicle deaths.¹⁹

Nonfatal mining injuries occurred at a rate of 3.5 per 100 full-time equivalent (FTE) workers in 2001, resulting in more than 500,000 lost workdays.²² The main causes of nonfatal mining injuries and illnesses were musculoskeletal diseases. Hearing loss, pneumoconiosis (“black lung” disease), and silicosis were also reported.²² The occupational fatality rate for mining is 30 fatalities per 100,000 in 2001, although a rate of 25.6 per 100,000 for 2001 is also reported.^{15, 22} The main causes of death in the mining industry were roof and wall collapse, and methane and coal dust explosions.⁹²

In 2000, agriculture, forestry, and fishing had an incidence rate of 6.8 per 100 FTE workers of nonfatal occupational injuries and illnesses for a total of 103,400.^{21, 22} Sprains and strains were the leading injuries and accounted for over 33 percent of injuries in agriculture, forestry, and fishing.²³ The Bureau of Labor Statistics surveys of occupational injuries and illnesses and their 1998 data show the morbidity rate of work-related illness was 30.9 per 10,000 for agricultural workers. The main causes were skin conditions, cumulative trauma, as well as respiratory diseases.^{22, 93} Analysis of emergency department admissions of nine rural hospitals showed work-related burns were common among construction workers, including burns to roofers, laborers, and welders.⁹⁴

A review of a rural emergency department found that agricultural work-related injuries accounted for as many as 12.5 percent of 12,000 injuries.

Occupational injuries were found more likely to occur among older people and men.¹⁷ This is consistent with the 1997 Census of Agriculture, which found farmers, with a mean age of 54, are generally older than workers in other occupations.²⁵ This is important since age has been found to increase the risk of both fatal and nonfatal injuries, including those from tractor overturns.^{22, 24, 25} A study found farmers over 55 years of age had an injury rate of 9 per 100 farmers.²⁶

Occupational injury death rates in agriculture are largely due to motor vehicle incidents, including tractors and collisions, as well other farm machinery accidents.²⁷ Various studies show the leading causes of agricultural work-related deaths and injuries are motor vehicle crashes, falling objects, machinery, falls, over-exertion, and cuts by sharp objects.^{17, 18, 95} A study found that during a 10-year period, 98 percent of agricultural deaths occurred to males, and 38 percent of the deaths occurred among people 65 years of age and older. The majority of the accidents were due to either rollovers or runovers.⁹⁶ Rollovers often occur as a result of attempts by farmers to avoid crashes.^{97, 98} A North Carolina study found that although farm vehicle crashes decreased between 1995–1999, farmers showed a greater concern about such crashes.⁹⁷

Pesticide and herbicide exposure are related to higher rates of certain cancers, and a study suggests an association between Parkinson's disease and occupational exposure to herbicides and insecticides.^{17, 99} It has also been suggested that poisoning by insecticides containing organophosphate and carbamate may lead to depression that can persist long after the exposure.¹⁰⁰ Several surveillance systems for pesticide-related illness and injury exist. Two are national systems, and there are additional statewide systems. The U.S. Environmental Protection Agency supports several statewide surveillance programs. Data from such a program between 1992–1996 of California, Florida, New York, Oregon, and Texas found that 33 percent of the

pesticide cases involved pesticide accidents, injuries, and exposures.¹⁹

To fully address the impact of occupational injuries in agriculture, the working agricultural population must be well defined.²² It is difficult, however, to gain exact counts of youth and migrant and seasonal workers among the agricultural population. The 2000 U.S. Department of Agriculture's National Agricultural Statistical Service (USDA NASS) survey found that of 1.24 million people hired to work on farms, 11.9 percent were migrant workers,¹⁰¹ although this is likely to be an underestimation.^{101, 102} The number of youth working on farms may be underreported since many farms are small and thus exempt from some regulations and reporting requirements. However, there are several surveillance systems that provide information about

Youth working in agriculture account for 40 percent of work-related fatalities among minors.^{4, 5}

agricultural occupational injuries. Generally, although data are available for fatal injuries, there are less data available about nonfatal injuries, making it

difficult to assess overall injury prevalence and morbidity. Data that are available are not always consistent.²² In addition, a number of categorizations of injuries overlap and may not provide the degree of detail desired.

The impact of work-related unintentional injuries in agriculture among youth is significant because youth working in agriculture account for 8 percent of the population, but they account for 40 percent of work-related fatalities among minors.^{4, 5} This includes not only youth living on and hired to work on farms but also youth migrant and seasonal farm workers.^{5, 29, 103, 104} Approximately 32,800 children under age of 20 were injured in 1998 in farm-related accidents, and it is estimated that 104 children under the age 20 die of agricultural injuries on U.S. farms each year.^{29, 39}

The rate of work-related agricultural fatalities for youth ages 15–19 is 12.2 per 100,000 FTE.^{28, 29} The rate is higher for males than females.³⁰ Males had a

work-injury rate of 2.4 per 100 FTE, while females had a rate of 1.5 per 100 FTE.^{29, 33} The highest rates per 100,000 of fatal injury to children occur in crop production in the Midwest, South, and West.^{28, 29} In the Northeast, the highest rates of fatalities occur in livestock production.^{28, 29} It is estimated, however, that the child and adolescent (age 19 and younger) farm resident death rate may be underestimated due to underreporting.³⁰

A five-state, 1990 analysis of the Regional Rural Injury Study-I database identified three main sources of work-related farm injuries: injuries due to animals, motor vehicle injuries, and injuries caused by machinery.¹⁰⁵ NIOSH and the USDA also conduct the Childhood Agricultural Injury Survey (CAIS). Results from this 1999 survey found that most youth (younger than 20 years of age) working on farms lived in the Midwest and South, and 73 percent of youth working in farms were male.¹⁰⁶ Consistent with the national survey, a study of North Carolina youth (ages 14–17) also found 72 percent of youth farm workers were male.³²

The majority of agricultural work-related injuries occurred to youth living on farms, to visitors, and to workers. Several studies identify the major causes of injuries to these youth as: falls, transportation-related incidents, and “being struck by objects.”^{31, 32, 33} A study of farm injuries among youth 16–19 years old found that between 1982–1994, the leading causes of death for occupational fatalities were machinery and electrical current.⁵ The study also showed a decrease of on-farm fatalities among youth ages 16–19. Between 1982–1985, the on-farm occupational fatality rate was 12 per 100,000, and it decreased during the last time period, 1991–1994, to a rate of 4.9 per 100,000.⁵

Injuries Due to Firearms

Firearm-related injuries contribute to both unintentional and intentional injuries. In 1999, the overall age-adjusted death rate for firearm injuries was 10.6 per 100,000, with the largest rate (21.6 per 100,000) among ages 20–24.³⁴ A six-year, Pennsylvania study of nonfatal firearm injuries found injury was greatest in urban counties and

lowest in rural counties. Nonfatal intentional injuries from assaults increased from rural to urban counties, while the reverse was seen for unintentional injuries—they decreased from urban to rural counties.^{35, 36} In rural counties, nonfatal firearm injuries occurred most often at home compared to urban counties where injuries occurred most often in the streets.³⁵

The unintentional firearm mortality rate is higher (1.0 per 100,000) in nonmetropolitan counties than metropolitan counties (0.5 per 100,000).^{2, 37} A study analyzed intentional and unintentional firearm deaths in Washington state between 1990–1996 and found rural areas had a higher proportion of gun deaths from shotguns and rifles than urban areas. Rural areas also had more than 50 percent of gun deaths due to handguns. Overall, handguns were the most commonly used weapon in both urban and rural areas.^{36, 107} A study of the Pennsylvania Trauma System Foundation database from 1987–2000 found that, of firearm injuries among those under 20 years of age, 90.7 percent were among males, and the majority (85 percent) of those studied were ages 15–19.³⁶ Urban rates of unintentional firearm injuries were found to be 10 times higher than nonurban (28.3 per 100,000 versus 2.4 per 100,000).

A study in a rural Iowa county found 85.8 percent of people in farm households reported having firearms in their household versus 61.1 percent of people living in rural towns. Twice as many farm households as town households claimed have a loaded, unlocked gun on the premises.³⁷ This is significant, since people who have guns in their home are twice as likely to be killed by guns as people who do not have guns in their home.¹⁰⁸

An analysis of firearm-related deaths in Kentucky among youth less than 20 years of age between 1988–1993 found that children in rural Kentucky had a higher risk of firearm-related death than children in urban areas, even when additional variables were accounted for, including emergency services availability.⁶⁸ Analysis from the Vital Statistics Mortality file and the National Traumatic Occupational Fatalities surveillance systems from 1982–1994 showed the two leading causes of death

for non-occupational on-farm fatalities among 16–19 year olds were drowning (38.9 percent) and firearms (28.6 percent).⁵ In rural areas, firearm injuries among children may be increasing, as a 1989–1992 study of injury-related deaths in children less than 15 years old in Montana found.⁶⁷

Drowning

An average of 32 childhood farm drownings occur annually. Between 1986–1997, the unintentional drowning rate for U.S. youth overall was 2.2 per 100,000 population. During the same time, childhood farm drownings occurred at an almost identical average annual rate of 2.3 deaths per 100,000 youth resident years.³⁸ Approximately a third of deaths were among children between zero to four years old, and 87 percent of deaths were among boys, making the rate of death 3.8 times higher for boys than for girls.^{5, 38, 39} Adolescents have also been identified as at risk for drowning.^{40, 41} Fatalities were most common in the South and Midwest, with the West and Northeast having the lowest rates. From 1986–1997, six states accounted for 45 percent of drowning incidences: Texas, Mississippi, Missouri, Oklahoma, Georgia, and North Carolina.³⁸ The causes of drowning also vary in rural areas. A study of drownings in a California county during a 10-year period showed that 85 percent of these fatalities occurred in an irrigational canal, and 53 percent were associated with illegal entry into the U.S. Such drownings in canals were associated with increased rate of water flow in the canal.¹⁰⁹

Falls, Burns and Poisonings

Falls, burns, and poisonings are also significant causes of unintentional injuries. In 1995, poisonings were the third leading cause of injury deaths, accounting for 11 percent of injury deaths. More than half (56 percent) of the deaths were unintentional.² In 1995, unintentional poisoning deaths had an age-adjusted death rate in metropolitan counties higher than nonmetropolitan counties—3.5 compared with 2.0 per each 100,000.² Analysis of California data between 1997–2000 showed most poisonings among California farm workers occurred

during use of pesticide and fumigation of grapes, oranges, and cotton.⁴² Lead poisoning data from Washington, D.C., suburban and rural Maryland, and Virginia show lead poisoning in the urban areas were 60 percent higher than the rural areas, and none of the rural group had blood lead at high-risk levels.⁶⁵

Falls were the fourth leading cause of injury death in 1995, and 93 percent of such deaths were due to unintentional injuries.² Falls from farm vehicles were a significant source of fatalities involving farm vehicles.²⁷ Age is also a strong factor in the occurrence of falls from injuries, particularly among the rural elderly and very young children.⁴³⁻⁴⁵ Between 1996–1998, falls were the main source of injury among children less than three months of age, while falls from furniture was a primary source of injury for children at six to eight months.⁴⁵

Deaths due to burns were the seventh leading cause of injury deaths in 1995, and the majority (89 percent) were unintentional injuries. Nationally, mortality rates for burns were higher in children ages one to four than for children ages five to 14.² The majority of deaths (91 percent) due to burns among children were caused by unintentional injuries. Alabama fatality reports for fire-related deaths during 1992–1997 showed fatality rates were higher among African Americans, men, children, and the elderly. Residential fires accounted for the largest proportion of deaths. While smoke detectors were present in only 32.5 percent of the residential fires, the presence of smoke detectors was more common with deaths in urban (41.8 percent) than rural areas (20.8 percent).¹¹⁰ A 1994–1995 study of Missouri children ages zero to 14 found an overall burn injury rate of 229 per 100,000 per year. Children zero to four years had a higher burn injury rate than children five to 14 years old; boys had a higher rate than girls, and African-American children had a rate of 592 per 100,000 per year compared to white children (291 per 100,000). Children in metropolitan counties had a slightly higher burn injury rate (363 per 100,000) than nonmetropolitan (296 per 100,000).⁴⁶

Intentional Injuries

Interpersonal Injuries

Violence among youth is a leading cause of intentional injuries, and data suggest an increasing trend in this category of injuries. From 1986–1995, overall juvenile arrests for violent crime increased 67 percent.¹¹¹ From 1991–1995, female juvenile arrests for violent crimes increased 34 percent—nearly four times the male juvenile increase of 9 percent.¹¹¹

The National Youth Gang Center estimates more than 24,500 gangs were active in more than 3,330 jurisdictions across the United States in 2000.⁴⁷ In 2000, 95 percent of respondents reporting gang activity identified activity within one or more high schools in their jurisdiction, and 91 percent reported gang activity within one or more intermediate schools in their jurisdictions.⁴⁷

Law enforcement agencies serving smaller cities and rural counties were less likely to report persistent gang activity between 1996–2000.⁴⁸ Thirteen percent of smaller cities reported persistent gang activity compared to only 7 percent of rural counties.⁴⁸ These numbers provide a strong contrast to 100 percent of law enforcement agencies in larger cities reporting such gang activity. Fifty-nine percent of law enforcement agencies in small areas (cities with populations between 2,500–24,999) reported that the majority of gang-related violent crime was committed against persons not involved in gangs, compared to 21 percent reporting the same in larger areas (cities with populations of 25,000 or more).⁴⁷

Family and intimate partner violence is an additional source of intentional injuries. Family violence, including partner and domestic violence, sexual assault, child abuse, and elder abuse is a problem in rural areas.⁴⁹ Nationally, a study found 31 percent of women report being physically abused by an intimate partner during their lifetime.¹¹² In rural areas, victims of domestic violence were “more likely to report they knew the perpetrator” than victims in urban areas.⁵⁰ A study of three Minnesota family practice clinics found that victims of domestic

abuse in small towns were older (mid-40s versus mid-30s) and twice as likely (25 percent versus 12 percent) to be currently involved in an abusive relationship.⁵² An Iowa study found that rural women were more likely than urban victims to seek help from clergy.⁴⁹ Results from a study of Hispanic and migrant workers treated at rural health clinics in Texas found the overall rate of domestic violence was 19 percent, similar to the national rate of 17 percent.¹¹³ A Georgia study found similar rates of spousal abuse among African American and white women in both urban and rural areas.¹¹⁴

However, there are conflicting data about the differences in domestic abuse among rural and urban areas. A study of domestic abuse in Iowa found no difference in rates among rural and urban residents.⁴⁹ However, a South Dakota survey of 534 clinic patients found physical assault was four times more frequent in urban than rural areas; fear of being assaulted was greater in urban areas, and being threatened with assault was more often reported in urban than rural areas.¹¹⁵ While it found that actual sexual assault was low in both urban and rural respondents, the overall rate of assault and fear of assault combined were significantly different between urban (35 percent) and rural (19 percent) residents.¹¹⁵

Partner violence and child abuse are often related; children in homes where domestic abuse occurs are more likely to experience physical abuse.^{77, 116-118} Data from the 1997 U.S. Department of Justice National Incident-Based Reporting System (NIBRS) for 12 states show that 13 percent of child abuse incidents reported to the police are associated with spouse abuse.⁹⁴ The National Family Violence Resurvey found the rate of child abuse was higher in rural areas, although the difference did not remain when variables such as race and family income were held constant.⁵³

Elder abuse is often referred to as a “hidden problem” in the U.S.⁸⁸ The definition and classification of elder neglect and abuse vary between states, making it difficult to gather and compare data. Neglect is defined as withholding food, medication, or other necessities whether

intentionally or unintentionally. Elder abuse includes physical, psychological, and emotional abuse, as well as sexual abuse, and financial or material abuse.^{85, 88} Clinical presentations range from the appearance of bruises and fractures, to dehydration, depression, apathy, and social withdrawal.⁸⁸

Data and reports are lacking that compare rural and urban rates of elder abuse. Nonetheless, it is important to pay attention to this issue given the increasing and disproportionate numbers of elderly people residing in rural areas. One out of four older Americans live in rural areas, making up 15 percent of the total rural population compared to 11 percent of metropolitan areas.^{51, 54} Between 1990–2000, the population of nonmetropolitan counties grew by 10.3 percent, and the elderly nonmetropolitan population is expected to increase as baby boomers turn 65 years old beginning in 2011.¹¹⁹

Homicide

In 1999, the homicide death rate was significantly higher for ages 15–24 (13.2 per 100,000) than among other age groups.³⁴ National data show that across all categories, increasing urbanization is strongly associated with higher homicide rates.^{20, 55} The Northeast and Midwest have the largest urban-rural differences in homicide, while the South has the highest homicide rates of all urbanization levels.²⁰ A study of the homicide rate in 3,130 counties comparing rural versus urban rates found a similar trend.¹²⁰ This is also consistent with Alabama data from 1980 and 1982, which show homicide rates in rural areas are lower than in urban areas.¹²¹ A study of 11 California urban and rural counties in 1985 also found a higher homicide rate in urban counties.⁶¹

Rural homicides are more likely to involve firearms than urban homicides.^{56, 57, 58} A study of a rural North Carolina county found higher than expected incidence and case fatality rates of firearm injury—66.4 per 100,000 versus the national rate of 38.6 per 100,000. The study also found the incidence and case fatality rates higher among African Americans than other racial/ethnic groups.¹²² In 1994, African-American juveniles were six times more likely than

white juveniles to be homicide victims.⁶⁰ In 2000, homicide was the leading cause of death for young African-American males and the second leading cause of death for young Hispanic males.^{15, 20, 59, 60} The disproportionate numbers of homicides among young African-American and Hispanic males is also apparent in rural areas.⁶¹

IMPACT OF THE CONDITION ON MORTALITY

In 2001, unintentional injuries were among the fifth leading cause of death overall and the leading cause of death for people ages one to four and 25–34.^{62, 63} Ethnic and racial disparities are apparent as unintentional injuries were the third leading cause of death for Hispanics and American Indians, the fourth for African Americans and Asian Pacific Islanders, and the fifth leading cause of death for whites.⁶²

Deaths due to motor vehicles are a leading cause of unintentional injuries, and the motor vehicle death

The agriculture, mining, forestry and fishing industries have among the highest occupational fatality rates.^{2, 17, 18, 23}

rate is higher in rural areas than urban areas. Safety belt use and use of all-terrain vehicles contribute significantly to traffic-related mortality.^{1, 11, 13, 91, 123}

The agriculture, mining, forestry, and fishing industries have among the highest occupational fatality rates.^{2, 17, 18, 23} While agricultural-related occupational fatalities occur most often among adults, youth are at significant risk, accounting for 40 percent of work-related fatalities in agriculture.⁴

Overall, for youth and adults, the unintentional firearm fatality rate is higher in nonmetropolitan counties than metropolitan counties.³⁷ Unintentional drowning-related fatalities were found to be most common in the South and Midwest.³⁸

Mortality data on intentional injuries caused by family violence is not easily available, especially on a rural-urban differentiation. Intentional injuries due to homicide show the South has the highest homicide

rates; areas in the Northeast and Midwest have greater urban-rural disparities in homicide rates.²⁰ Homicide is the leading cause of death for African-American males and the second leading cause of death for Hispanic males.^{15, 20}

IMPACT OF THE CONDITION ON MORBIDITY

The majority of data related to injury morbidity is limited to a few areas of unintentional and intentional injuries, such as occupational injuries—specifically, agriculture and family violence. Pesticide use may contribute to higher morbidity among agricultural occupational injuries.^{17, 95} Falls from vehicles, falls among the elderly, as well as poisonings from pesticide use were also found to be significant contributors to morbidity.^{27, 42, 64} Falls, burns, and poisonings were also significant causes of unintentional injuries.^{42, 43, 65, 66} In addition, firearm-related injuries among children in rural areas may be increasing.^{67, 68}

Unintentional injuries involving family and intimate partner violence show a link between injuries and related illnesses. For example, victims of domestic violence may have a greater likelihood of substance abuse as a coping strategy.^{69, 70} Victims of domestic violence are also more likely to attempt suicide and to have mental health problems, including depression, an anxiety disorder, and post-traumatic stress disorder.¹¹⁸ A study of five domestic violence shelters in Alabama either located in or serving rural communities found that women who experienced both sexual and physical violence were two to six times more likely to have various health consequences than women who experienced only physical abuse.⁷¹⁻⁷⁴ There are also negative consequences for children who witness domestic violence, including psychological problems, behavioral problems, cognitive difficulties, mental health problems, substance abuse, post-traumatic stress disorder, and other trauma-related symptoms.⁷⁵⁻⁷⁹

Since morbidity data are limited generally and even more so in regards to urban and rural differences, there is a recognized need for additional surveillance of injury morbidity data for both unintentional and

intentional injuries. This is important since morbidity data—not just mortality data—are also necessary for developing and assessing prevention and treatment policies.⁹⁶

BARRIERS

It is necessary to assess the barriers in rural areas to develop effective programs and policies. Unintentional injuries due to motor vehicles in rural areas were found to be affected by factors such as time of driving (dusk, dawn, night), delayed reporting and discovery of accidents, the fact that rural areas are less likely to have trauma systems or trauma centers, and they are less likely to have health professionals experienced in major trauma.^{9, 10, 80, 81}

Social isolation is also a barrier for rural residents seeking services, particularly for the elderly and for victims of domestic abuse. Cultural factors may also impact treatment-seeking behaviors; for example, rural women may be more likely to seek help from clergy than counselors about domestic violence. Barriers within organizations may also exist. For example, a study showed a majority of domestic abuse victims would like to approach the issue with their physicians, yet another study showed that 42 percent of internal medicine residents felt unprepared to deal with domestic violence issues.⁸² Although the American Medical Association, the American College of Obstetricians and Gynecologists, and others recommend screening, only 10 percent of physicians and 17 percent of obstetricians ask.¹²⁴

KNOWN CAUSES OF THE CONDITION OR PROBLEM SO EFFECTIVE INTERVENTIONS OR SOLUTIONS CAN BE IDENTIFIED

Although unintentional and intentional injuries have their own set of contributing factors, there is a degree of overlap among several types of injuries. Data suggest that age may be directly associated with injury in rural populations.²⁰ A six-year analysis of rural elderly suggests the likelihood of falling increases with each year of age.⁴³ In addition, in fatal accidents, the average age of farm drivers is higher than for other drivers.^{1, 27}

A study found motor-vehicle accidents in lower population density areas were due to greater alcohol use, greater numbers of crashes on low-traffic roads, and gravel surfaces.¹⁰

Deaths related to all-terrain vehicles may be due to the lack of helmet use, since the immediate cause of death of two thirds of deaths was trauma to the head or neck, and 74 percent of those who died were not wearing helmets.¹³ Other contributing factors include lack of experience, alcohol or drug use, passengers, and excessive speed.^{13, 125, 126}

A risk factor for occupational injuries is the nature of the work itself and the necessary use of heavy machinery and vehicles that may or may not include safety features. Among youth, a risk factor for occupational injuries is the age appropriateness of jobs performed.⁴ Another is the susceptibility and sensitivity of children to various exposures.⁴ Although the Fair Labor Standards Act sets the federal minimum age for child labor, the minimums are not strictly enforced on farms, and farms with less than 11 employees are exempt from the Occupational Safety and Health Administration (OSHA) standards.⁴

The risk of falls among older women may be increased by depression.⁴³ A study of home health clients in rural Illinois showed previous falls, frailty, physical inactivity, balance problems, absence of handrails, and uneven floors were related to the incidence of falls.⁴⁴ Studies show conflicting evidence of falls and medications—some show no relationship while some show certain prescriptions may increase the probability of falling, and other medications may decrease the probability of falling.^{43, 44}

Risk factors for domestic violence include geographical and social isolation, and a lack of privacy, resources, and services. In addition, drug and/or alcohol use by the perpetrator is a risk factor for domestic abuse.^{49, 113, 127-130} These risk factors are often greater in rural areas and may reduce the effectiveness of programs designed for urban areas when they are employed in rural areas.^{49, 52, 118, 127}

A multitude of factors affecting caregivers and victims contribute to elder abuse and neglect. Caregiver risk factors include stress, exhaustion from caregiving, mental illness, alcoholism, and substance abuse.⁸⁸ Victim risk factors include poor health, inability to perform activities of daily living, cognitive impairment, and social isolation. Of particular significance to rural areas is the lack of community support that may increase risk because of the contribution to caregiver stress, frustration, and burnout.⁸⁶ Institutionalization in a nursing home is also a risk factor for elderly abuse since nursing home residents are more likely to be vulnerable, more socially isolated, and mentally impaired.¹³¹ Institutional factors such as staff shortages and inadequate training and screening procedures may contribute to a greater likelihood of elder abuse. Although continuous progress is being made in improving the quality of care in nursing homes, the problem persists and presents specific challenges.¹³²

PROPOSED SOLUTIONS OR INTERVENTIONS THAT ARE FEASIBLE IN RURAL COMMUNITIES

A critical step toward decreasing the incidence of injury and violence-related mortality and morbidity is the improvement and coordination of surveillance activities. Currently, data on injury are mainly collected at the national level and not the state or local levels.⁸³ The surveillance systems at the state level that do exist vary and are not uniform.¹⁹

In addition to surveillance, the populations of interest need to be well defined and classified. Agricultural workers, for example, include not only farmers but also their families, youth, and migrant and seasonal workers.²² Further classification of other contributing factors in injury, such as farm vehicles, will also improve data collection.²⁷ Demographic characteristics also need to be included, not only for occupational injuries but for other areas of injuries, as well.²² A demographic characteristic to consider is the victim's place of residence, which is useful in examining motor vehicle and ATV-related injuries. While the incidence of events is greater in rural areas, it is unclear if the victims are rural residents. This is

significant because it affects the target populations and places for prevention and education programs.

Education campaigns in rural areas can be effective. A study measuring changes in attitudes and behavior in response to a public health education campaign targeting domestic violence in a rural county suggests that local public health education campaigns in rural areas are effective methods for targeting men.⁸⁴ Another study also shows that in child abuse prevention, there has been progress among several agencies and organizations in an isolated rural area in creating and improving networking for information sharing and for greater access to resources.¹³³

Findings from three prospective longitudinal surveys supported by the Office of Juvenile Justice and Delinquency Prevention found that involvement in violent behavior began at a very young age; it occurred among both boys and girls, and violence did not decrease during the late teenage years. Such findings highlight the need to implement violence prevention programs earlier—not waiting until middle school, for example, and to target both boys and girls—not simply boys.⁶⁰

Acceptance of potential programs and policies should also be studied prior to implementation to identify possible programs and barriers that will need to be overcome. A California study of 542 adults asked their willingness to support domestic violence prevention programs through various financial methods. A majority (79.4 percent) supported raising funds for domestic violence prevention, although men were less likely than women to support such funding. Most respondents approved of paying \$5 or less through fees and donations.¹³⁴ With regard to possible interventions, a study found 90 percent of abused victims would like to discuss the issue with their doctors.⁸²

In areas of injury and violence where surveillance data as well as effectiveness studies are scarce, particularly along a rural and urban division such as elderly abuse, public education and awareness raising may be a critical first step. Such programs could focus on educating the public at large about

the abuse, how to identify it, and where to seek help.⁸⁵ This could help alleviate the problem of underreporting, which is caused by several factors including denial, embarrassment, a victim's cognitive or physical inability to seek help, as well as ageism.^{86, 87} Primary care providers may be best suited to identify and report victims of elder abuse since such patients use health care services more often, and that may be their only social contact.⁸⁸

Finally, it is important to note that regardless of the injury and violence area being assessed, rural regions vary in the causes and prevalence of injury and violence morbidity and mortality.^{10, 89} Programs and policies should match local characteristics as closely as possible; one solution will not work for all rural areas. It is necessary to acknowledge that progress is being made in this aspect. Currently, 10 NIOSH Centers for Agricultural Disease and Injury Research, Education, and Prevention exist that deal with health and safety issues pertinent to their specific location.¹³⁵

COMMUNITY MODELS KNOWN TO WORK

A number of programs are presented in the Models for Practice section. These models are collaborative efforts to provide one of or a combination of the following: preventive services, educational opportunities, and methods and resources in an effort to reduce and prevent injury and violence.

SUMMARY AND CONCLUSIONS

Overall, age-adjusted injury and unintentional injury death rates are higher in rural areas than urban areas.^{1, 2} Rural disparities in injury and violence appear to be more prevalent among unintentional rather than intentional injuries. Differences in rural and urban areas considered in this paper are based principally on mortality data since morbidity data are extremely limited in injury and violence surveillance. Mortality rates are higher in rural areas in accidents involving motor vehicles, safety belt use, and all-terrain vehicles. The same is also true in occupational injuries, especially since mining, agriculture, forestry, and fishing have the highest fatality rates of all industries. Unintentional firearm-

fatality rates are also higher in rural areas, although intentional firearm fatality rates (for example, in homicides) are higher in urban areas. The remaining unintentional injuries either had similar prevalence rates in both urban and rural areas, had higher rates in urban areas, or data were insufficient to suggest a difference. This includes unintentional injuries caused by drowning, falls, burns, and poisonings.

Intentional injuries are not significantly more prevalent among rural populations. Youth violence and homicide are more common in

Rural disparities in injury and violence appear to be more prevalent among unintentional rather than intentional injuries.

urban areas, while family and intimate partner violence occurs at similar rates in urban and rural areas. Family and intimate partner abuse victims face additional barriers in seeking services in rural areas. Data regarding elder abuse were scarce since both surveillance and program effectiveness research is relatively small.⁵¹

In addition to disparities in prevalence, disparities exist in risk factors between urban and rural areas. Although age, for example, is related to incidence of injury in most settings, age may present additional risks for injury among rural residents engaged in high-risk occupations, e.g., aging farmers. Rural geographic isolation affects the provision and seeking of services, for example, by affecting the availability of experienced health professionals and availability of educational, preventive and treatment programs, and facilities. Social isolation is also a barrier for rural residents—particularly for the elderly and for victims of domestic abuse.

It is important to understand the disparities in prevalence and risk factors among rural populations and to incorporate explanatory factors for such disparities in the development, implementation, and evaluation of programs and policies aimed at injury and violence prevention. Urban programs may not be effective in rural areas, and programs effective in

one rural area may not be effective in another rural area. Improved surveillance of morbidity and mortality data, a clearer definition of populations studied, and more evaluation of program effectiveness are essential to meet the Healthy People 2010 goals for injury and violence reduction among rural populations.

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