

Personal and Community-Based Health Promotion and Morbidity Prevention

Intentional and Unintentional Injury Mortality and Morbidity

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Introduction

Approximately 4.7% (57,063) of the total deaths in U.S. women in 2007 were due to an injury-related cause, including suicide and homicide.¹ Although women account for slightly less than one-third (31.3%) of all injury deaths each year, injury is important in the spectrum of diseases and conditions affecting women due to the timing of these events in the life course: contributions to mortality, morbidity, and disability, and in later life, threats to independent living. Injury exerts both direct and indirect effects on the lives of women. Despite men having higher mortality, injury continues to be the leading cause of death in women aged 1 to 39 years. During peak childbearing and childrearing years, three of the five leading causes of death in women aged 15 to 39 years are injury related—suicide, homicide, and unintentional injury. In addition, injury has an indirect impact through the disruption of

women's lives and added stress as women frequently serve as caregivers to injured children, spouses/partners, and parents of both sexes.

The relative rank of the injury burden among all conditions and diseases affecting the health of women varies depending on 1) the indicator measures used to describe the burden of disease; 2) the fineness of categories of injury intent and mechanisms or causes; and 3) the composition of the population in terms of age, race/ethnicity, socioeconomic and educational status. Within these categories, the relative importance of types of injuries varies considerably across the age span. For example, injury ranks fourth among causes of mortality, but first in years of potential life lost (YPLL) before age 65 among all women (Figure 3-1). This difference is accounted for primarily by differences in the younger ages at which injury exerts its most profound influence compared with older ages at onset of major chronic diseases and conditions.^{2,3}

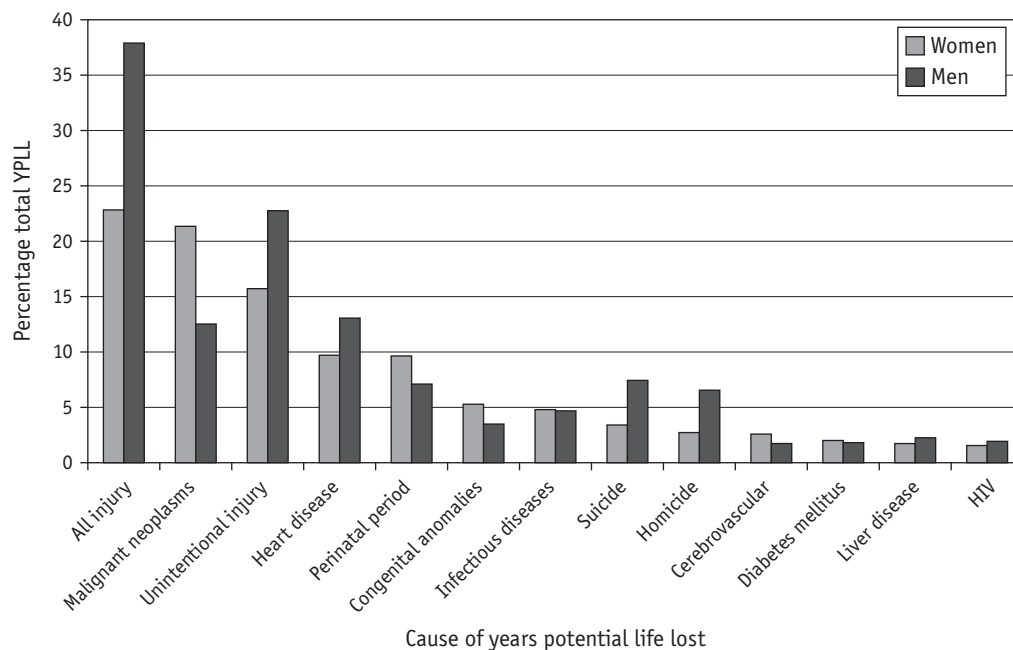


Figure 3-1 Percent of Years of Potential Life Lost in women and men by leading cause of death.

Source: Data from Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. www.cdc.gov/ncipc/wisqars. [2011 Feb 18].

In this chapter, the relative rank of injury is demonstrated among other prevalent diseases and health conditions women experience across the life span. The distribution of America's aging population by gender and age can be expected to affect the relative importance of several injury mechanisms. Research has tended to give greater emphasis to injuries among men who generally present with greater mortality risk; in contrast, the frequency of injury among women is handled statistically by controlling for gender.⁴ In preparation of this chapter limited data were found for specific types of injury among women by age and race. Such information is key to addressing injury in an aging population. Therefore, this chapter largely presents original data analyses of injury mortality and morbidity across the age span among women. Except where otherwise stated, analyses use online data provided by the Centers for Disease Control and Prevention's web-based injury statistics query and reporting system (WISQARS).¹

The Relation of Injury to the Age and Gender Structure of the U.S. Population

Females comprise a larger proportion of the U.S. population beginning in their late 20s for non-Hispanic whites (whites) and non-Hispanic blacks (blacks) and by age 30 for Hispanics (Figure 3-2). The disproportionate age-specific gender distribution is accelerated in the elderly years as women live longer lives than men.^{5,6} This has implications for the magnitude of population-level injury, the types of injury observed, and caregiving demands.

The "baby boom" and the general trend toward longer life expectancy over the last several decades are leading to record numbers of older Americans in the total population (Figure 3-2a).^{7,8} The race/ethnic specific population pyramids presented in Figures 3-2 b-d enable an appreciation of diverse composition of the American population by 5-year age intervals and the variability across race and ethnicity.⁵ The composite of four pyramids indicates the

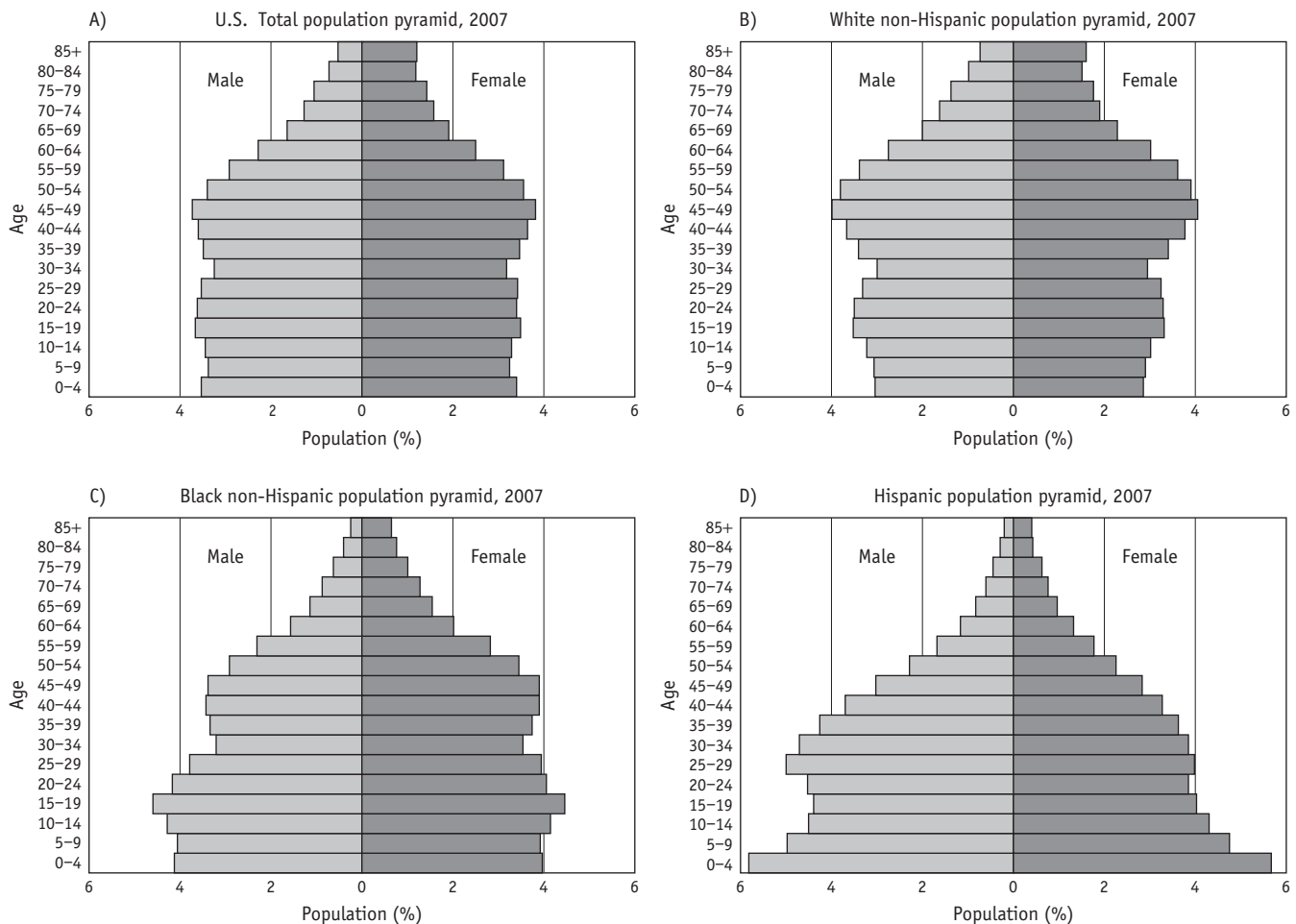


Figure 3-2 U.S. population pyramids by sex and 5 year age groups, 2007.

Source: Data from Web-based Injury Statistics Query and Reporting System (WISQARS). (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

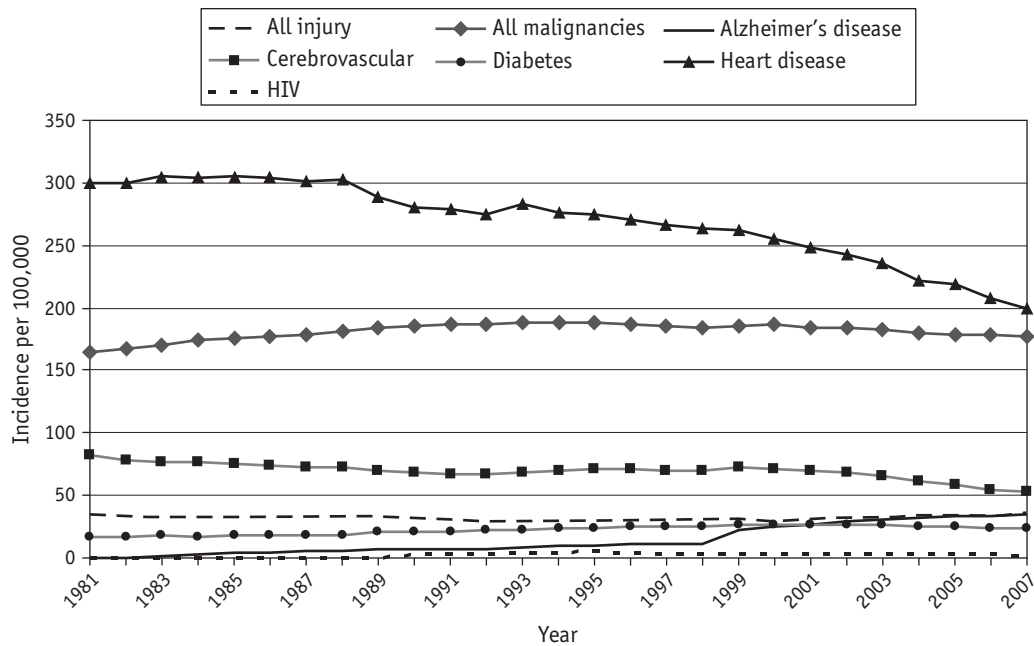


Figure 3-3 Trends in cause-specific female mortality, U.S. 1981–2007.

Source: Data from Web-based Injury Statistics and Reporting System [WISQARS] 2007. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

population age structure varies considerably by race and ethnicity, with a “broad-based, slender and pointed pyramid” for Hispanics reflecting a relatively younger population structure. In contrast, whites have a more “rectangular bulging belt-line shape” indicating more older men and women, the baby boom generation (bulging belt-line). As they advance toward older ages, their incidence of injury mechanisms is changing with the emergence of frailty-influenced injury risk factors that contrast with younger generations.^{9,10}

The shape of these pyramids, together with the age-specific injury and mortality rates in later sections of this chapter enable a glimpse into future 1) key injury risks and the relative importance of injuries among women; 2) injury prevention strategies to reduce the cost of injury-related care; 3) demands on women as the principal informal caregivers; and 4) demands on health and long-term care facilities to provide rehabilitation to injured women.

Magnitude of Injury Relative to the Total Disease Burden in the United States

For the last 25 years, mortality from all types of injury has ranked below heart disease, cancer, and cerebrovascular disease and higher than death due to human immunodeficiency virus (HIV), diabetes, and Alzheimer’s disease (Figure 3-3).^{1,11} The relative contribution to female mortality has narrowed between injury and both heart disease and cerebrovascular disease as the latter two causes of death have declined while total injury has remained fairly constant.

Table 3-1

Percent of all deaths due to injury among females by age group, United States, 2007

Age Group	Percent of Deaths Due to Injuries (All Intents)
< 1 year	6%
1–4 years	38%
5–9	39%
10–14	42%
15–19	67%
20–24	58%
25–34	42%
35–44	25%
45–54	13%
55–64	5%
65+	2%
All ages	4%

Data from Web-based Injury Statistics Query and Reporting System (WISQARS). (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

The proportion of injury mortality to all mortality is shown in Table 3-1. Injury is the cause of 6% of deaths in females under 1 year of age, but by age 15–19, accounts for two-thirds of all-cause deaths in that age category. The leading cause of injury death and YPLL in women is motor vehicle traffic (Table 3-2).

Table 3-2

Relative rank of injuries in females by Years of Potential Life Lost (YPLL) before age 65, cause of death, hospitalization, and emergency department visits (2007)

Mechanism of Injury	YPLL	Death	Hospitalization, Nonfatal	Emergency Department Visits, Nonfatal
Motor vehicle traffic, all	1	1	3	4
Fall, unintentional	8	2	1	1
Poisoning, unintentional	2	3	4	9
Suicide (fatal)/self-harm (nonfatal), all	3	4	2	11
Homicide (fatal)/assault (nonfatal), all	4	5	8	7
Suffocation, unintentional	5	6	13	15
Fire/burn, unintentional	6	7	14	12
Drowning, unintentional	7	8	16	17
Pedestrian, unintentional	9	9	9	14
Other transport, unintentional	10	10	6	8
Struck by/against, unintentional	11	11	5	3
Firearms, unintentional	12	12	17	16
Pedal cyclist, unintentional	13	13	12	13
Cut/pierce, unintentional	14	14	15	5
Overexertion, unintentional	15	15	7	2
Bites and stings, all	-	-	10	6
Foreign body, unintentional	-	-	11	10

Data from Web-based Injury Statistics Query and Reporting System (WISQARS). (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Morbidity

Injury accounted for 3.8% of the 20.5 million hospitalizations of women each year and 29.1% of the 63.2 million emergency department visits in women in 2007.¹² Unintentional falls, which ranked second among leading causes of injury death and eighth in YPLL, are the leading cause of morbidity as measured by either injury-related hospitalizations or emergency department visits (Table 3-2).

Overexertion emerges as an important cause of emergency department (ED) use among women.¹³ Its low rank in both YPLL and deaths indicate that overexertion is generally a nonfatal cause of injury in women. This and the large difference in costs for overexertion between nonfatal ED visits and nonfatal hospitalizations indicate that it is generally managed in the emergency department without requiring hospitalization. In contrast, motor vehicle traffic-related injury, the leading cause of injury-related death and YPLL, is also important for its contribution to nonfatal hospitalization and emergency department visits (Table 3-2).

Women continue to experience considerable morbidity following traumatic injury and are reported to have higher

symptoms of acute stress, diminished quality of life, and more depression following trauma than men.¹⁴⁻¹⁷

Years of Potential Life Lost

The relative rank of injury-related YPLL before age 65 is shown in Table 3-2. The burden of total YPLL for all-cause injury is slightly higher than all malignancies (21.8% and 21.3% respectively) and more than double that of heart disease. Unintentional injuries ranked second (15.7%) among YPLL and intentional injury (homicide and suicide) ranked fifth. Injury deaths concentrated among older aged women contribute fewer YPLL; as noted in Table 3-2, unintentional falls rank tenth in YPLL but second in cause of mortality that occur primarily among the elderly.

Healthcare Costs

The relative rank of the injury burden using direct healthcare costs noted in Table 3-3 indicates the importance of type of injury. Frequently, these injury mechanisms exert their influence on healthcare costs through high incidence of emergency department visits. For example, care of

Table 3-3**Estimated costs of all causes of injury from emergency department visits, hospitalizations and deaths, 2005**

	Mechanism	Nonfatal ED Visits	Nonfatal Hospitalizations	Total Direct Medical Costs	Total Estimated Cost
1	Fall	\$4,286,127,000	\$7,653,412,000	\$12,152,862,000	\$30,050,354,000
2	Motor vehicle traffic	\$1,637,264,000	\$3,418,625,000	\$5,189,246,000	\$22,968,021,000
3	Poisoning	\$32,897,000	\$1,190,792,000	\$1,280,723,000	\$9,715,677,000
4	Struck by/against	\$1,949,903,000	\$628,157,000	\$2,579,618,000	\$7,941,347,000
5	Overexertion	\$2,023,851,000	\$286,149,000	\$2,310,009,000	\$6,859,898,000
6	Firearms	\$3,123,000	\$42,807,000	\$58,741,000	\$3,446,835,000
7	Cut/pierce	\$388,417,000	\$242,697,000	\$633,456,000	\$3,062,935,000
8	Suffocation	\$6,923,000	\$81,429,000	\$135,856,000	\$2,642,835,000
9	Bites and stings	\$634,411,000	\$125,790,000	\$760,201,000	\$2,416,596,000
10	Pedestrian	\$57,167,000	\$419,122,000	\$499,376,000	\$2,303,000,000
11	Other transport	\$294,732,000	\$419,862,000	\$719,203,000	\$2,188,079,000
12	Fire/burn	\$216,707,000	\$116,568,000	\$368,198,000	\$1,799,436,000
13	Pedal cyclist	\$162,056,000	\$184,456,000	\$348,153,000	\$1,079,811,000
14	Drowning	\$78,000	\$34,202,000	\$38,546,000	\$876,688,000
15	Foreign body	\$89,629,000	\$204,070,000	\$293,699,000	\$678,484,000
16	Natural/environmental	\$6,706,000	\$30,973,000	\$43,719,000	\$417,609,000

Source: Table shows the estimated costs (in USD) of all intent injury by top mechanisms for nonfatal emergency department visit medical costs, non-fatal hospitalization medical costs, total direct medical costs (ED visits, hospitalizations, and deaths), and total combined costs (direct medical costs and work loss). Data from Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. www.cdc.gov/ncipc/wisqars. Accessed February 18, 2011.

women for overexertion and for animal bites or insect stings ranked fifth and ninth among injuries contributing to healthcare costs due to emergency department visits (Table 3-3).^{12,13,18}

Age- and Race-Specific Injury Mortality Among Women

The type of injuries occurring among women differs by age and intent, necessitating assessment by age-specific causes of injury to accurately capture the impact among women across the life span. Examining total injury in summary form for all ages and race/ethnic groups masks important differences in incidence and modifiable risk factors across age and race, impeding identification of gaps in progress among specific ages with considerable disparity remaining among race/ethnic groups.^{19,20}

All-cause injury deaths are shown in Figure 3-4 by age group and race/ethnicity. Very young black female children

have higher all-cause injury mortality than Hispanic or white children until adolescence.²¹ Disparities differ considerably with both intentional and unintentional injuries contributing to the observed racial disparities observed in young children.^{22–25} All older women, regardless of race/ethnicity, experience escalating injury mortality. Several types of injuries demonstrate age-specific increases, but mortality associated with falls exceeds all others; deaths due to falls among older American women are potentially misclassified on emergency room records and death certificates.²⁶

Intentional Injury Mechanisms

Approximately one-fourth (23.1%) of injury deaths of women are intentional—primarily suicide and homicide, which rank below unintentional injury, cancer, heart disease, and perinatal conditions in their contribution to YPLL. Intentional injury deaths are higher in YPLL than infectious diseases, cerebrovascular disease, or diabetes.

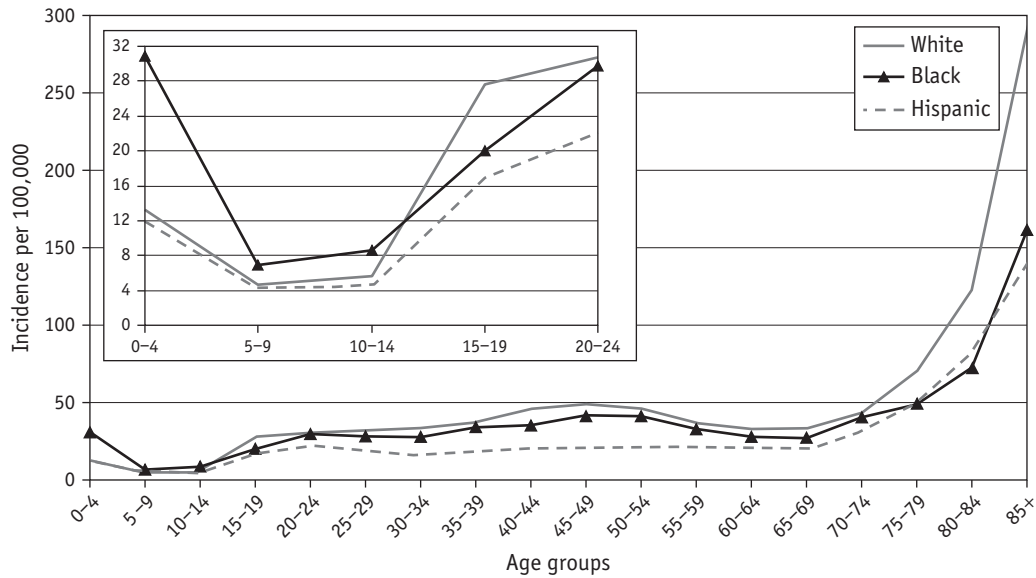


Figure 3-4 All injury deaths of females by age group and race/ethnicity.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS]. National Center For Injury Prevention and Control, Centers for Disease Control and Prevention.

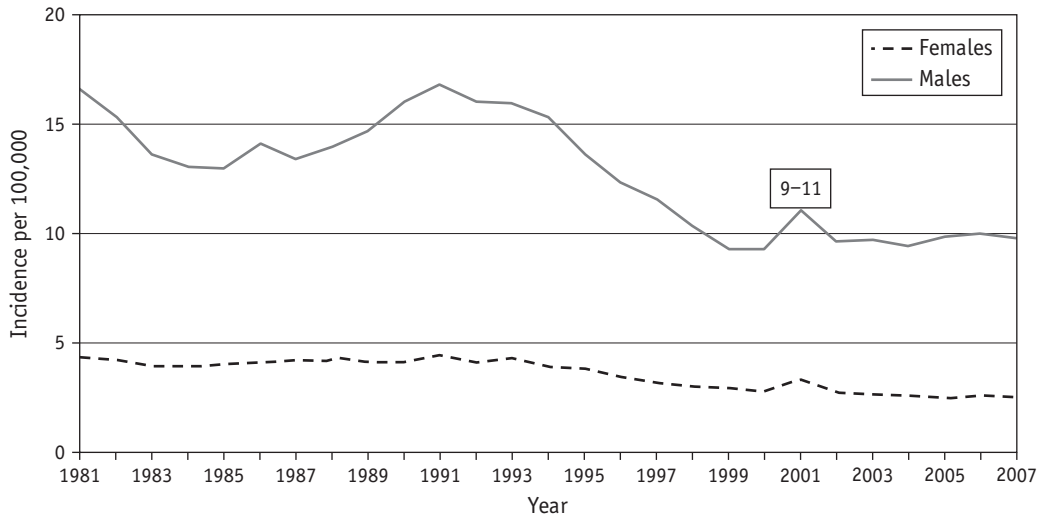


Figure 3-5a Homicide deaths per 100,000 by sex and year, United States 1981–2007.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS]. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Homicide

Figure 3-5a notes the decline in homicides beginning early in the 1990s among males and females that followed increases in the 1980s associated with the crack drug epidemic.^{21,27,28} Although deaths associated with September 11, 2001 have been variously categorized over the last 10 years, the current classification in WISQARS is homicide, accounting for the 2001 blip observed in Figure 3-5a.¹ Commonly employed mechanisms of homicide in rank order include firearms, cut/pierced, suffocation, fire/burn, and poisoning.

Homicide rates are highly age specific and vary by gender, race, and ethnicity (Figure 3-5a and Figure 3-5b).

Women have rates of homicide that are just over 25% those of males, but otherwise show similar patterns by age and race. Black female infants and children have elevated rates compared to Hispanics and whites. Black female homicide rates are approximately 12% those of black males but are significantly higher than those of white females (Figure 3-5b). Homicide rates decline for elementary school aged children but increase among adolescents and teens, where they peak at the highest observed lifetime rates. Young Hispanic females have higher rates than young white females beginning in adolescence and continuing through middle age before narrowing in elderly ages (Figure 3-5b).¹

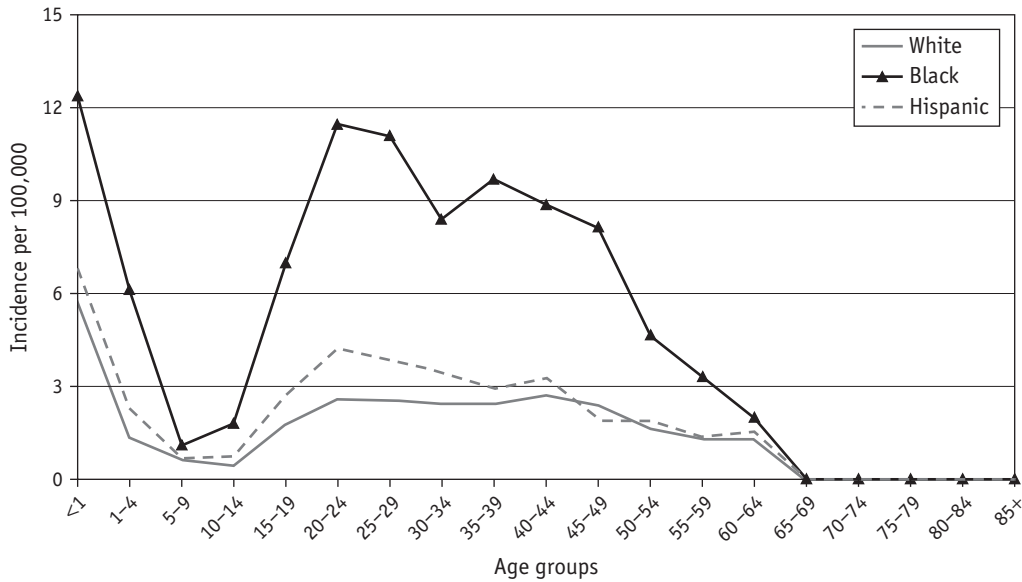


Figure 3-5b Homicide deaths among females per 100,000 by age group and race.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS]. 2007. National Center For Injury Prevention and Control, Center for Disease Control and Prevention.

Suicide

More than 7,300 American women die annually by suicide; only modest improvements have been documented over the last 25 years.^{29,30} Between 1999 to 2007, suicide rates among white women increased 25% in contrast to 7.5% among Hispanic and 9.3% among black women. In 2007, the rate of suicide in white women was 3.5 times that of Hispanic and black women.

Although male rates of suicide are three to four times higher than those of females, rates among women are highly age dependent with distinctively different patterns by race and ethnicity (Figure 3-6). Rates for white women increase in the teen years, peak in middle age, begin to decline in the early 50s, and level off around age 70. Hispanic and black women show similar patterns with lower incidence. Among women dying by suicide in 2007, poisoning was the leading mode, followed by firearms, suffocation, falls, and drowning.¹

Women are at higher risk of depression and experience more atypical symptoms of depressive illnesses and increased seasonal affective disorder than men. Although women are more likely to attempt suicide than men, they are less likely to die.³¹ Depression is present in about half of all suicides,³² but screening for warning signs has had limited success as a strategy for suicide prevention.^{22,23}

Unintentional Injury

Among the nearly 44,000 women who died of unintentional injuries in 2007, the rate varied by age, race, and ethnicity over the life span. Preadolescent black females have higher unintentional injuries than Hispanic or white children. The recent increases observed for total

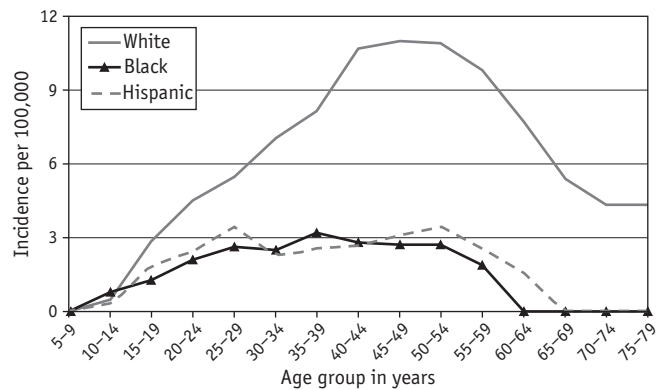


Figure 3-6 Suicide deaths among females per 100,000 by age group and race.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS] 2007 National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

unintentional injury mortality is related to poisonings and falls in adults over age 45 years.^{33,34}

Motor Vehicle Traffic Deaths

Motor vehicle deaths peak in the teenage years and fall by age 30, followed by increases after age 65 (Figure 3-7). Greater mortality among the elderly appears to be due to age-related deficits despite fewer miles driven annually. Elderly drivers have the lowest crash rates per 100,000 licensed drivers but the highest traffic fatality rates per 100,000 miles traveled.⁴⁵ Vehicle occupant injury contributes disproportionately in very young black children, a finding that is reportedly associated with lower use of occupant restraints.⁴⁶⁻⁵⁰ White adolescent females have motor vehicle occupant death rates that are one-third

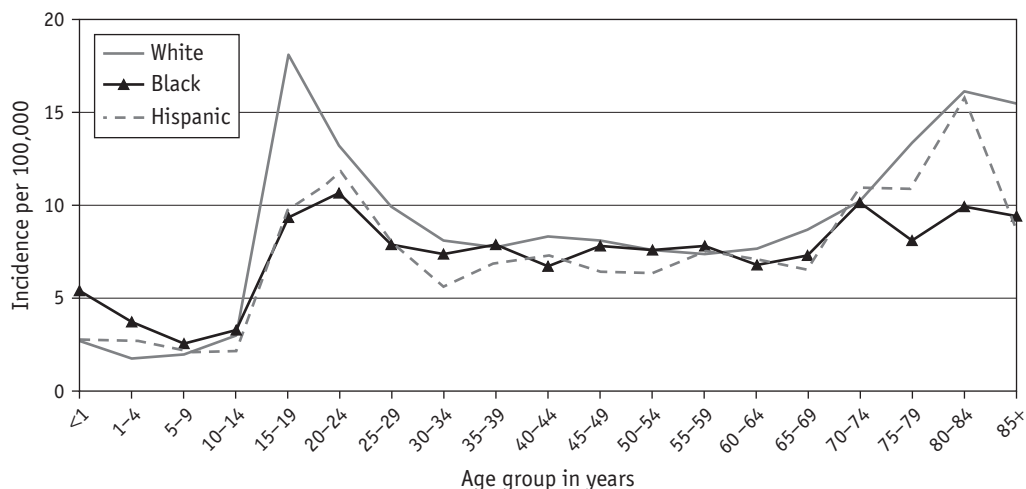


Figure 3-7 Motor vehicle deaths among females per 100,000 by age group and race.

Source: Data from Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2007). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. www.cdc.gov/ncipc/wisqars. [2011 Feb 18].

higher than in Hispanics and nearly double those of black teens. Adolescent teens, particularly adolescent black teens, are less likely to use seat belts as an occupant than as a driver.⁵¹

Occupant injury deaths increase as white females grow older with rates rising from mid to late 50s, a trend that continues through age 85. Women and blacks are more likely to die as passengers than as drivers. Older drivers tend to drive fewer miles and have lower crash rates per mile traveled but have higher case fatality rates than younger drivers. This pattern has been attributed to the presence of comorbid conditions and frailty.⁵²

Risk factors for motor vehicle occupant mortality include failure to wear a seat belt, presence of alcohol, and being teenage or elderly drivers.^{35,36} Trends in declining motor vehicle mortality rates have been variously attributed to a wide range of improvements including driver behavior, legislation, engineering, and enforcement.³⁷⁻⁴⁰ Graduated driver licensing has been shown to lower teen driver mortality.⁴¹ Alcohol laws have been extended beyond the drinking driver to include the seller, server, and host of underage drinking.⁴²⁻⁴⁴ Legislation requiring in-person license renewal for older adults has been reported to reduce motor vehicle related fatality rates in elderly drivers.⁴⁰

Pedestrian

Pedestrian injury accounts for approximately 12% of all motor vehicle deaths of women but is highly variable by age and race/ethnicity. Among Hispanic and black preschool-aged female children, pedestrian deaths are double those of white children, accounting for more than one-quarter of all motor vehicle traffic fatalities. Among elderly women, pedestrian deaths account for 50% of all motor vehicle deaths of Asian women, 35% of Hispanic women, 23% of black women, and 12% of white women. Pedestrian-related injury reduction has been achieved by providing better illumination, creating pedestrian islands, and installing clear warning signs.⁵³ Increasing attention

is being given to the environment in which older women and children reside. Many major cities, including New York, have transformed their approach to pedestrian safety through identification, targeted modification, and redesign of the highest risk crossings. Redesigns include increased use of pavement markings, electronic signage, adjustments in the timing allowed for pedestrian crossing at wide intersections, addition of timing signals for crossing, and midway raised median pedestrian stopping points.

Falls

Approximately 11,000 women die of falls each year. Unlike many other injuries, fall-related deaths tend to occur at older ages among women. This chapter focuses primarily on falls in younger age groups. Falls on the same level or on stairs significantly contribute to hospitalization among younger age groups, although serious pediatric injury and death occur after falls from height, particularly from windows in urban settings.^{54,55} In some cities regulations requiring installation of window guards have virtually eliminated preventable falls from windows as a major cause of pediatric mortality.⁵⁴ Serious playground-related fall injuries have been diminished by lowering maximum fall heights in equipment design and installing rubberized ground cover.⁵⁶

Preventing falls in younger populations is one of injury prevention's success stories. Various efforts have included successfully addressing falls on stairs with baby gates at the top and bottom in addition to redesigning baby furniture and baby walkers.^{22,23} This emphasis on reducing pediatric mortality due to falls has resulted in gradual mortality declines among very young children.

Unintentional Poisoning

Both female and male preschool black children tend to have higher mortality rates from unintentional poisoning than Hispanic or white children.⁵⁷ Among women, deaths due to unintentional poisoning peak around age

40 for whites and by the mid-50s for black and Hispanic women (Figure 3-8). Hispanic women have rates that are approximately one-third those of black and white women. After age 50, white and black women show nearly identical rates and patterns of unintentional poisoning deaths. The low death rates observed for young Hispanic women persist through the elderly years.

Although unintentional poisoning deaths, particularly from opioids, have received considerable attention, questions have been raised regarding potential misclassification of unintentional poisonings that may have been intentional.⁵⁷ Additional studies are underway to investigate whether declining suicide rates and rising unintentional poisoning represent related phenomena.⁵⁷

Federal legislation requiring medicines and poisonous household products to be placed in childproof containers has contributed to injury prevention.²² In addition, the

storage of household products out of reach or in locked cabinets has been effective, in contrast to placement of Mr. Yuk pictures on poison items, which did not deter poisoning among small children.²²⁻²³ For seniors and older adults many medication-related poisonings can be avoided by careful delineation of dosages and schedules by doctors and healthcare professionals.²⁴

Fire and Burn Deaths

Large disparities in fire and burn deaths are noted among American women; black females are at three to four higher times risk compared with white women across most of their life span with the largest disparities found among very young (aged 0–4 years) and the elderly (aged 65 years and older). Hispanic rates are closer to those of white rates (Figure 3-9).

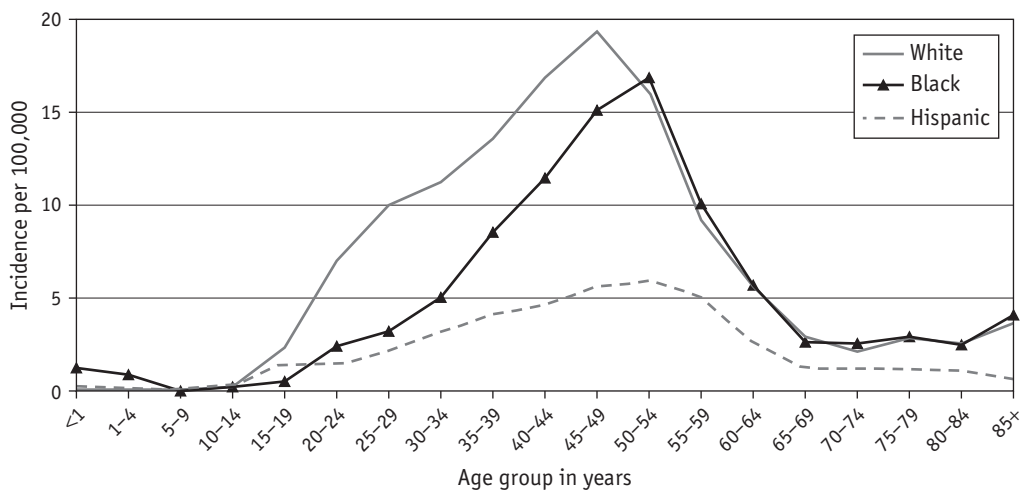


Figure 3-8 Unintentional poisoning deaths of females by age group and race/ethnicity.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS] 2007. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

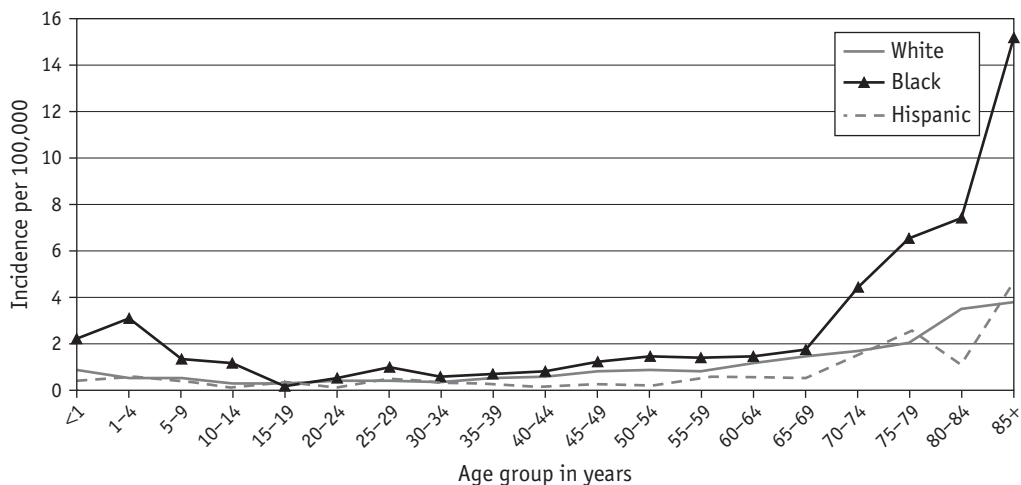


Figure 3-9 Fire/burn deaths of females by age group and race/ethnicity.

Source: Data from Web-based Injury Statistics and Reporting System [WISQARS] 2007 National Center For Injury Prevention and Control, Centers for Disease Control and Prevention.

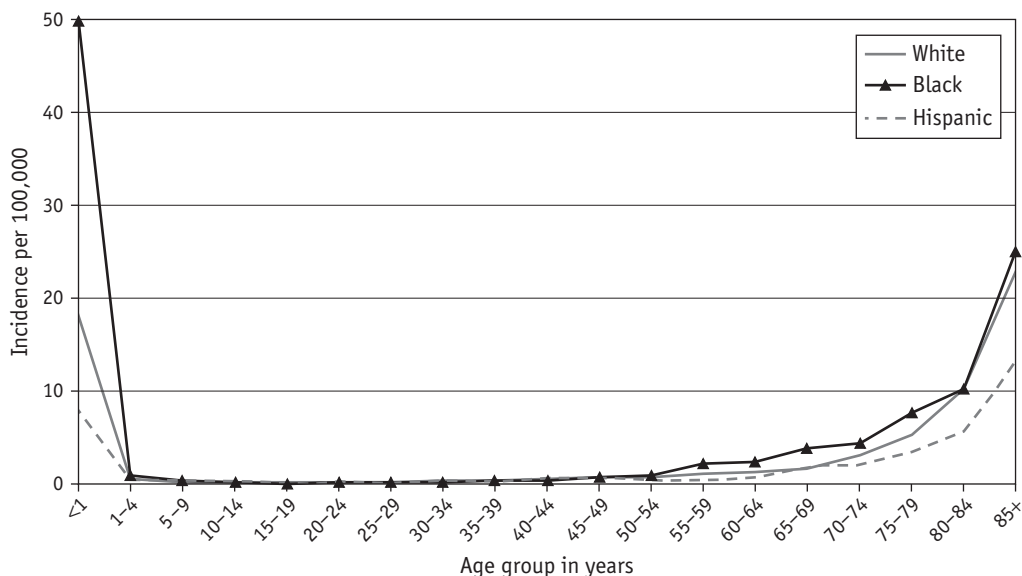


Figure 3-10 Suffocation deaths among females by age group and race/ethnicity.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS] 2007. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Several factors have been posited to explain the differences in deaths due to fire and burns: black women may live in older or substandard housing, in inner-city multi-family dwellings, in lower socioeconomic neighborhoods, or in more crowded conditions where auxiliary heating units may be more frequently used. Cigarette smoking, the most frequent cause of home fires and burn fatalities, often ignites bedding, furniture, or clothing.^{20,22,58,59} More older black women than similarly aged white women die from fires, possibly because more white women reside in long-term care facilities⁶⁰ whereas more blacks living at home may have disabilities. Prevention efforts to decrease fire and burn injuries focus primarily on risk modification through safety code alterations, smoke detectors, and sprinkler installations in addition to home safety education.⁶¹

Suffocation

Unintentional suffocation deaths of females are highest among infants younger than 1 year and adults aged 80 and older (Figure 3-10). Deaths are higher in black women compared to Hispanic and white women (50 per 100,000 vs 20 per 100,000 deaths). Hispanic rates are less than half that of white rates. Rates of suffocation mortality among females are low between ages 5 to 44, but increase among women aged 50 and older.

Risk factors for suffocation have shifted over time as regulatory and educational approaches addressed contributing causes, such as unsafe baby products and plastic bags.²³ Current risk factors include women sleeping with their infants, infant bedding, toys and objects in infant sleep areas, and infant sleep position.^{23,62,63} In a multiethnic study of home safety among young children, sleep position was shown to vary by race/ethnicity, with black parents more frequently placing children on their stomach.⁶⁴ Many cases of suffocation can be prevented among children by removal of small toys that may cause choking.⁶³ Among

unintentional injuries of very young children, suffocation was the only injury that increased, and only among infants under age 1 year. This temporal shift raises the questions of a potential change in diagnostic classifications from sudden infant death syndrome (SIDS) to suffocation.

Firearm Injury, All Intentions

Of the 31,213 persons who died in the United States from firearm injury in 2007, women accounted for 4,177 (13.4%). Despite being a relatively small portion of total firearm deaths, women are nearly three times more likely to die from a firearm than from a traffic-related pedestrian injury. The distribution differed by age, race and ethnicity (Figure 3-11) with higher rates per 100,000 women being among black women (4.1) than whites (2.9), American Indians (2.5), or Hispanics (1.5). The majority of deaths in women occur between the ages of 15 and 69. Very few of the 76 (1.8%) firearm deaths of females classified as unintentional in 2007 were among young children and adolescents (n = 14) or very young children (n = 4).

Firearms were used by women in 52% of all suicides and nearly 2,000 women were victims of firearm-related homicide. Strategies for prevention of firearm deaths have variously included gun licensing and carrying laws, safe locked storage of guns in the homes, gun buyback programs, and other means to remove guns from homes. Drug control enforcement, firearm training and education, trigger locks, and loading indicators have all been used as preventive measures.^{24,65,66} Approximately 90% of gun deaths occur indoors, the majority in the home. Prevention strategies to reduce unintentional firearm injury in children include establishing safety skills that teach children to immediately leave and inform an adult upon finding a firearm.⁶⁷

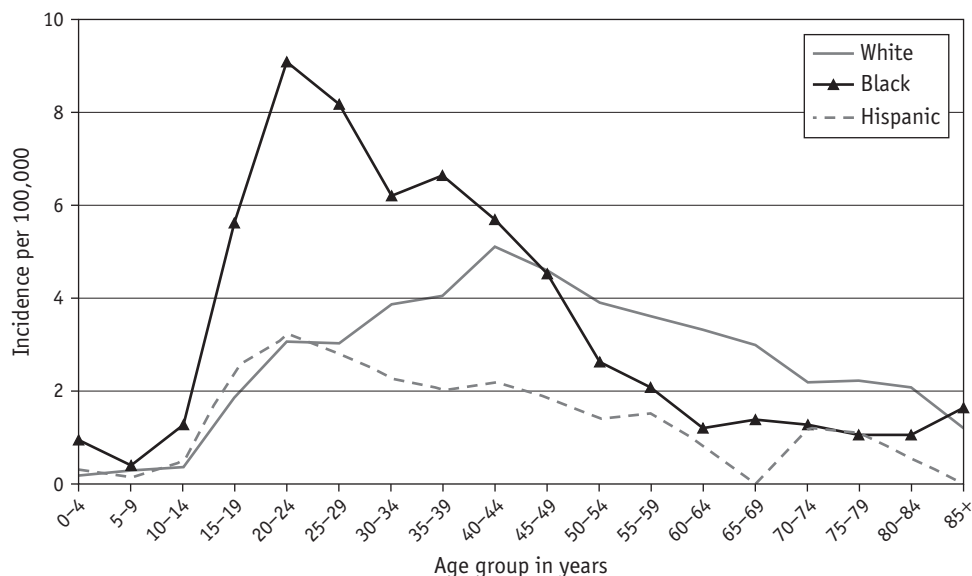


Figure 3-11 Firearm deaths in females per 100,000 by age group and race.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS] 2007. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Drowning and Environmental and Human-Caused Disasters

Over 4,000 Americans die from drowning each year. Women account for about one-fourth of all drowning deaths, including very young children and the elderly whose risk is two to three times greater than among women of other age groups. Risk of drowning varies by geographic region and across age, gender, race, and ethnicity.^{20,68,69} Preventive strategies vary by age. Among children aged less than 5, drowning frequently occurs in bathtubs and swimming pools while being supervised by a parent.^{23,24,68} Several strategies have been proposed for prevention: educational strategies with improved adult supervision, elimination of unattended standing water, swimming lessons, cardiopulmonary resuscitation training, regulations regarding fencing of swimming pools, installation of self-closing and locking gates, and redesign of pool drains.^{23,24,68}

Environmental and natural disasters, such as the Gulf Coast Hurricane Katrina in 2005, have contributed to the higher mortality among elderly men and women. Natural and environmental deaths among those aged 85 and older reached as high as 191 and 265 per 100,000 for women and men, respectively. Rates were higher in men, but older women comprised a larger proportion of the population (Figure 3-2) and contributed larger absolute numbers of deaths. Preventive strategies for natural disaster deaths have included early warning systems; use of newer electronic social media to notify those at risk; public education; evacuations; improved highway, building, and environmental designs for earthquakes, hurricanes, and flooding; improved organized disaster management plans, facilities, and personnel; and other approaches.⁷⁰

Historically, human-caused disasters have affected younger or working age populations more than the elderly and tended to be gender neutral or to affect greater numbers of men. One-fourth of deaths related to September 11, 2001 were of women, 97% of whom were aged 20–64 years. Similarly, after the Oklahoma City bombing in 1995, the Oklahoma state vital statistics indicated that over 80% of victims were of working age with approximately 39% women.¹ Some of the many preventive strategies include increased public education, screening, surveillance, and disaster preparedness at the individual, community, and governmental levels.^{70,71}

Injury Caused by Adverse Effects of Medical Care and Drugs

Mortality and morbidity associated with adverse effects of medical care are the “iceberg” of unintentional injury among women.⁷² Most experts in the field note that the problem is underreported in relation to its contribution to mortality, morbidity, and healthcare costs.⁷³ Of the nearly 1,400 deaths in women, 88% were recorded as attributal to adverse effects of medical care and 12% to adverse drug events (Figure 3-12).

Recreational and Sports Injury Morbidity

Although recreational injury is an infrequent cause of mortality, sports and recreational injuries contribute significantly to morbidity in young women. The knee and ankle are the most common sites of sports and recreational injury in both males and females. Gender differences in exposure to football, the leading sport for injury, account for a large portion of increased injuries among males compared to females. The second leading sport for

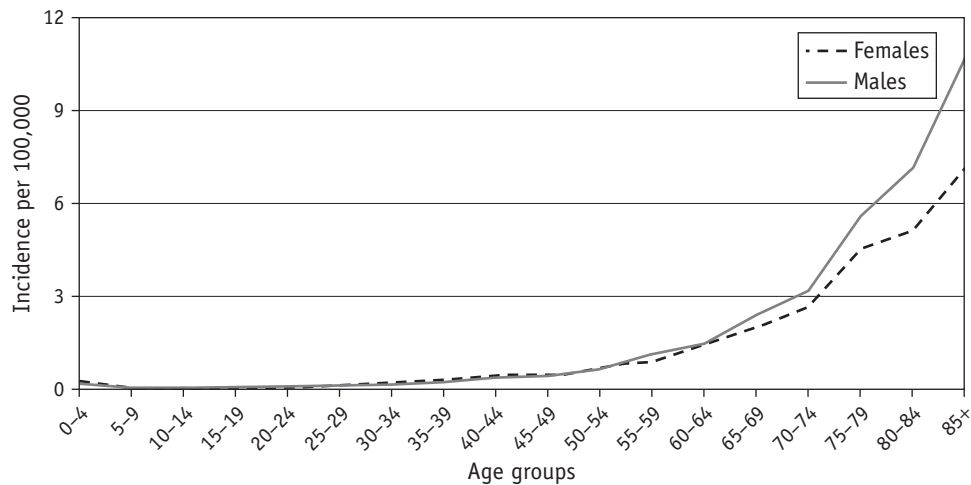


Figure 3-12 Adverse medical and drug effect deaths by sex and age group.

Source: Data from Web-based Injury Statistics Query and Reporting System [WISQARS] 2007. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

injury is basketball where approximately 60% of all injury is to the knee.⁷⁴

Two types of knee injury-related conditions are noted to be higher in females: patellofemoral pain syndrome and noncontact anterior cruciate ligament (ACL) injury, the latter of which occurs two to eight times more frequently in females.⁷⁴ Although factors contributing to these differences are still under investigation, several studies in humans and animals have suggested menstrual cycle hormonal changes may affect knee laxity and stiffness;⁷⁵ male-female differences in neuromuscular preactivity during side-cutting that contributes to lower knee stability in women.⁷⁴ Animal studies have identified sex-specific characteristics in landing, jumping, and running;⁷⁶⁻⁷⁹ biomechanical and kinematic differences at the hip, knee, and ankle;⁷⁶ and differences associated with collagen mRNA expression in Type 1 collagen (T1C) and type 3 collagen (T3C) in rats with increased ACL stiffness and failure load in female rats.⁷⁷

Occupational Injury

Despite a steady increase in workforce participation by women, the risk of occupational injury among women remains at approximately half that of men in all sectors except service, education, and agriculture.⁸⁰ Women make up approximately half of the workforce, but differ significantly by job sector. The type and severity of workforce injury, disability, and death vary by occupation and job classification. Differentials in the healthy worker effect limit detection of adverse events experienced by working women.⁸¹ Following occupational injuries, women may take longer to return to work.^{80,81}

Although more women are nurses or nursing aides, men working in these positions are nearly twice as likely as women to be injured on the job. Compared to male occupational injury, women are less likely to experience toxic exposures but are more likely to be injured due to falls. Among occupational injuries, women are reported to

have higher rates of carpal tunnel syndrome, burns, and musculoskeletal injury including sprains and fractures.⁸⁰ Despite the fact that women comprise nearly half of the workforce, workstations are often designed to meet the needs of men with implications for injury prevention among women.⁸⁰

Home and Homelessness Injury

Very young children and the elderly have higher exposure to and increased risk of home-related injury and death. Women and children living in poverty are at higher injury risk than those in wealthier families.²³ The home mortgage crisis with the accompanying home foreclosures is reported to have had a larger impact on families and mothers in lower income strata, minority women, and single mothers.⁸¹ Homelessness is associated with higher fall-related injury in homeless children and adolescents. Falls from furniture are higher in homeless children aged less than 5 years.

Burns are a major cause of morbidity and mortality among very young children and among elderly women (Figure 3-9). The majority of fire-related deaths are due to residential fires, but two-thirds of burns in homeless, sheltered children are from hot liquids and vapors.⁸² Among home injury success stories are the widespread legislation mandating smoke alarm installations, which have reduced fire and burn mortality; childproof closures on household poisons and medicines, leading to reduced home poisonings;²³ and fall prevention strategies such as installation of baby gates on stairs and window guards in urban housing, which have produced significant declines in falls from height including baby walkers, stairs, and windows.^{23,24,54}

Summary

Although injury mortality in women contributes a smaller proportion to total mortality than injuries of men, injury remains the leading cause of death among women during

peak childbearing and childrearing ages. Three of the five leading causes of death in young adult to middle-aged women are unintentional injury, suicide, and homicide. A major underrecognized impact of injury on the lives of women is the increased stress of caring for an injured child, spouse/partner, or aging parents. Although the data in this chapter primarily report injury occurring directly to females, injury to family members has a significant impact on the lives of mothers. Whereas some types of injuries have been declining, population aging is contributing to larger numbers of injured elderly females and males and is a major contributor to the loss of independent living while increasing healthcare costs.

Discussion Questions

1. Despite the higher mortality burden of chronic and infectious disease in women, injury is the highest contributor to YPLL in women. Explain this phenomenon and discuss how future epidemiologic research might address the impact of YPLL in women's health.
2. Motor vehicle injury comprises a significant portion of the injury burden in women, particularly in older ages. What factors might contribute to the observed elevated motor vehicle related mortality rates in older women, despite their having the lowest crash rates per 100,000 licensed drivers?
3. The injury burden varies depending on the measure used. Discuss the commonly used measures and explain how they differ and their strengths and weaknesses. Do you think it is helpful to have multiple measures? Why or why not?
4. Firearm injury in women is fragmented across mechanisms and intent, partially masking its importance in the health of women. Discuss the role of firearms in unintentional injury, suicide and homicide. Explain how preventive strategies might be expected to influence rates across intents.
5. Fall-related injury is the second leading cause of death in women and the highest contributor to morbidity as measured by hospitalizations and emergency department visits, but ranks tenth in YPLL. Explain.
6. How do individual-level factors like race and ethnicity manifest in injury risks? What are potential strategies to reduce such disparities in injury prevention efforts?

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