



UNDERSTANDING DISPARITIES IN CHILD AND ADOLESCENT INJURY: A REVIEW OF THE RESEARCH



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Executive Summary

Disparities in the risk of intentional and unintentional child and adolescent injury are found across several distinct populations within gender, race/ethnicity, geography, disability, sexual orientation and gender identity, health literacy, and socioeconomic status (SES), among others. The first step in reducing and ultimately eliminating these disparities is understanding what these disparities are and who is affected by them. This paper summarizes the literature describing disparities in child and adolescent injury. Among its findings are:

Injury Disparities by Sex

- Males have higher rates of injury-related hospitalization and death than females, except hospitalization related to suicide attempts (i.e., self-inflicted injuries).
- Females are more likely than males to be victims of sexual assault, to report being bullied, and to be hospitalized for self-inflicted injuries.

Injury Disparities among Racial and Ethnic Groups

- From 2006 to 2015, American Indian/Alaska Natives (AI/AN) ages 10 to 19 years had the highest suicide rate among all racial and ethnic groups (CDC, 2017).
- AI/AN infants from birth to 12 months are particularly susceptible to fatal motor vehicle traffic (MVT) injuries when compared with other racial groups (Bernard, Paulozzi, & Wallace, 2007).
- Black and Hispanic youth ages 15 to 19 are at increased risk of homicide and assault compared to White and Asian/Pacific Islander youth (CDC, 2011a).
- Black young adults are at an increased risk of suicide in their early 20s, peaking at age 24 for young Black men and in the late 20s for young Black women, compared with Whites, whose risk for suicide peaks later in life (Wang, Yu, Wang, Bao, Gao, & Xiang, 2016).
- Black children are at increased risk for fire/burn injuries, drowning, pedestrian injuries, and falls, and Black infants (< 1 year) are at greater risk of unintentional suffocation death than other racial/ethnic groups (Bernard et al., 2007).
- The injury mortality rate for Hispanic infants and children is lower than rates for other ethnicities (Rosenbaum & Blum, 2015).
- Hispanic adolescents recovering from traumatic brain injury (TBI) are more likely to experience disability and to remain significantly impaired relative to Whites (Jimenez et al., 2013).
- Whites ages 15 to 19 years have higher rates of combined suicide death and attempt than their Black, Asian/Pacific Islander, and Hispanic peers (CDC, 2011a).
- White adolescents use more substances, including prescription drugs, than other groups (Kim, Moon, & Kim, 2011).

Injury Disparities and Geography

- Children in the South experience higher rates of drowning fatalities than children who live in the Northeast, Midwest, and West (CDC, 2017).
- Children who live in more densely populated areas, or in multifamily units, that have pools have a higher risk of pool submersion than those who live in less densely populated areas, or in single family units, with pools (Shenoi et al., 2015).
- Children who live in warmer climates experience a year-round increased risk of hyperthermia after being left unattended in a vehicle as compared with children living in colder climates who are mostly at risk during the warmer months of the year (Duzinski, Barczyk, Wheeler, Iyer, & Lawson, 2014).
- Although the rate of self-inflicted injuries is higher in urban/metro areas, rural areas show a higher suicide rate.
- While rural areas have a higher rate of suicide, urban areas have a higher rate of homicide (Bergen, Chen, Warner, & Fingerhut, 2008).

Injury Disparities and Disability

- Children with disabilities face a heightened risk of violence and unintentional injury compared with children without disabilities, and they face different types and levels of risks depending on their type of disability.
- Children with multiple disabilities are at an even greater risk of a school-related injury compared with children with one disability or no disability (Ramirez, Peek-Asa, & Kraus, 2004).
- Children with attention deficit/hyperactivity disorder (ADHD) are at higher risk of sustaining head injuries, unintentional poisonings, and pedestrian injuries compared with children without ADHD (CDC, 2014; Stavrinou et al. 2011).
- In a study of adults with severe mental illness, a high proportion (56.7%) had experienced multiple categories of childhood abuse, which increased their risk of experiencing a head injury (Schneeberger, Muenzenmaier, Battaglia, Castille, & Link, 2012).
- Children younger than 15 years of age with autism experience a higher risk of death by unintentional injury from drowning, suffocation, and asphyxiation than their counterparts without autism (Guan & Li, 2017).
- In children ages 11 to 18 years with severe intellectual disabilities, an association has been found between the absence of speech and an increase in self-injury and severe destructive behavior (Oliver, Petty, Ruddick, & Bacarese-Hamilton, 2012).

Injury Disparities and LGBTQ Populations

- LGBTQ populations are at increased risk of engaging in suicidality (e.g., suicide plan, suicide attempt, medically-treated attempt), up to more than double the risk of heterosexuals (Kann et al, 2016b; Bontempo & D'Augelli, 2002).
- LGBTQ youth have an increased risk for non-suicidal self-injury compared with their non-LGBTQ counterparts (Reisner, Biello, Perry, Gamarel, & Mimiaga, 2014).
- LGBTQ youth have elevated risks of bullying and assault, particularly while at school compared with non-LGBTQ youth (D'Augelli, Pilkington, & Hershberger, 2002).
- Bullying and assault increase the likelihood of young LGBTQ males (as compared to LGBTQ females) experiencing long-term depression and suicidal ideation into their late adolescence and early adulthood, and engaging in self-harm and high-risk sexual behavior (Russell, Ryan, Toomey, Diaz, & Sanchez, 2011).
- Sexual minority youth are more likely to experience physical dating violence than their non-minority peers and are less likely to report that violence as it would identify them as sexual minorities (Luo, Stone, & Tharp, 2014).

Health Literacy and Injury Risk

- Caregivers with low or limited health literacy are less effective in preventing injuries and responding to emergencies affecting their children than caregivers with high health literacy (Sanders, Shaw, Guez, Baur, & Rudd, 2009).
- Individuals who have limited literacy in English, regardless of their primary language, may have difficulty reading or understanding warning or drug labels, safety instructions, or other information related to injury prevention, compared with those with higher English literacy levels (Davis et al., 2006).

Injury Disparities and Socioeconomic Status

- Children from low SES backgrounds are at higher risk of infant mortality (Rosenbaum & Blum, 2015), drowning, and suffering assault or fall-related injuries relative to children from high SES backgrounds (Birken & MacArthur, 2004).
- Children in the lowest SES groups experience two times the mortality rate and 2.6 to 2.8 times the unintentional injury/homicide rate of children in higher SES groups (Singh & Kogan, 2007).
- County-level poverty is associated with the risk of unintentional injury mortality, including fatal motor vehicle traffic crashes, poisoning, drowning, and fire/smoke exposure (Karb, Subramanian, & Fleegler, 2016).

Injury prevention approaches must take into consideration the influence of individuals, relationships, communities, and the broader society in order to successfully address the factors that cause and contribute to child and adolescent injury disparities. Input from the affected communities is also necessary to develop and implement effective injury

prevention interventions that will reduce disparities. In addition, more research is needed to explore how different kinds of risks and different kinds of disparities influence one another.

Introduction

Health disparities are preventable differences in the burden of injury or of opportunities to achieve optimal health that are experienced by socially disadvantaged populations (Centers for Disease Control and Prevention [CDC], 2008). Health disparities are often related to the historical and current unequal distribution of social, political, economic, and environmental resources. In particular, disparities in the risk of intentional and unintentional child and adolescent injury are found across several distinct populations within sex, race/ethnicity, geography, disability, sexual orientation and gender identity, health literacy, and socioeconomic status (SES), among others. Understanding disparities in child and adolescent injury is an important and necessary step in reducing and eliminating those disparities. This paper summarizes the literature describing disparities in child and adolescent injury.

Age and Developmental Stages of Childhood and Adolescence

Infants and young children are just beginning to develop coordination and motor skills and do not yet have impulse control and judgment. At the same time, they are curious to explore their environment and have limited cognitive abilities for understanding risk, which can lead them into potentially dangerous situations (Schwebel & Brezausek, 2014). Young children also do not have control of their physical or “built” environment, such as the layout of the home, housing quality, and transportation issues (Cummins & Jackson, 2001). Consequently, they are dependent on others, primarily parents but also caregivers, community members, and society at large, to reduce their risk of injury. Older children, while still small in size, are physically more capable of certain activities. However, they have not yet mastered the cognitive skills to judge their abilities and to assess the risk of activities or situations.

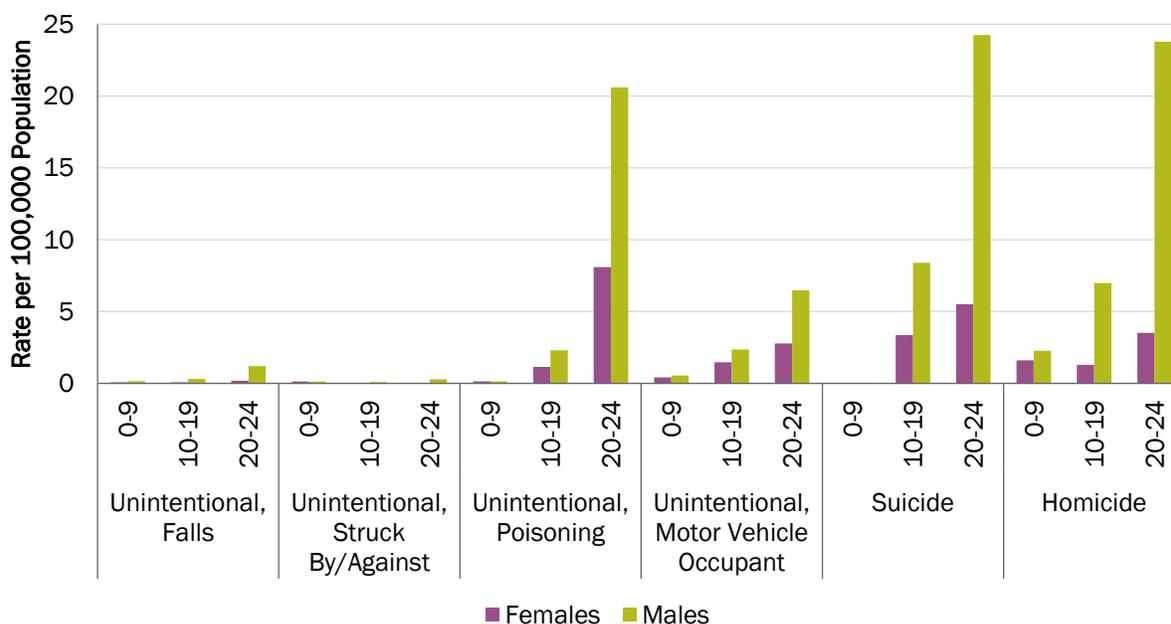
Between the ages of 10 and 19 years, youth become more independent and are more likely to engage in high risk behaviors while cognizant of the consequences. They are developing their own identities, interests, and relationships, and are starting to make their own decisions. The increasing autonomy of adolescents often puts them at odds with parents, teachers, peers, and others, contributing to feelings of isolation from friends, family, and the social network that generally surrounds younger children (Galligan, Barnett, Brennan, & Israel, 2010; Kim et al., 2011). For some adolescents, mental health issues surface during this time, which complicates their relationships, while increasing the possibility of self-injurious behavior and suicide (Murphey, Barry, & Vaughn, 2013). For most adolescents, the

ways in which they act, interact, and react to their surroundings are marked by the competing demands of autonomy, social and gender norms, and the perceptions and expectations of peers in the surrounding culture.

Injury Disparities by Sex

Males. Males across all age groups have higher rates of injury-related hospitalization and death compared with females, except hospitalization related to suicide attempts (i.e., self-inflicted injuries). Males suffer higher fatality rates from falls, assault, unintentional poisoning, pedestrian injuries, motor vehicle-related injuries, drowning, and suffocation (CDC, 2011a). Males, particularly those ages 20 to 24 years, also have higher fatality rates resulting from unintentional injuries, suicide and homicide compared to females. Figure 1 shows the injury death rates by sex for children and youth ages 0 to 9, 10 to 19 years, and 20 to 24 years.

FIGURE 1. RATE OF INJURY DEATHS PER 100,000 POPULATION, AGES 0-24, 2015

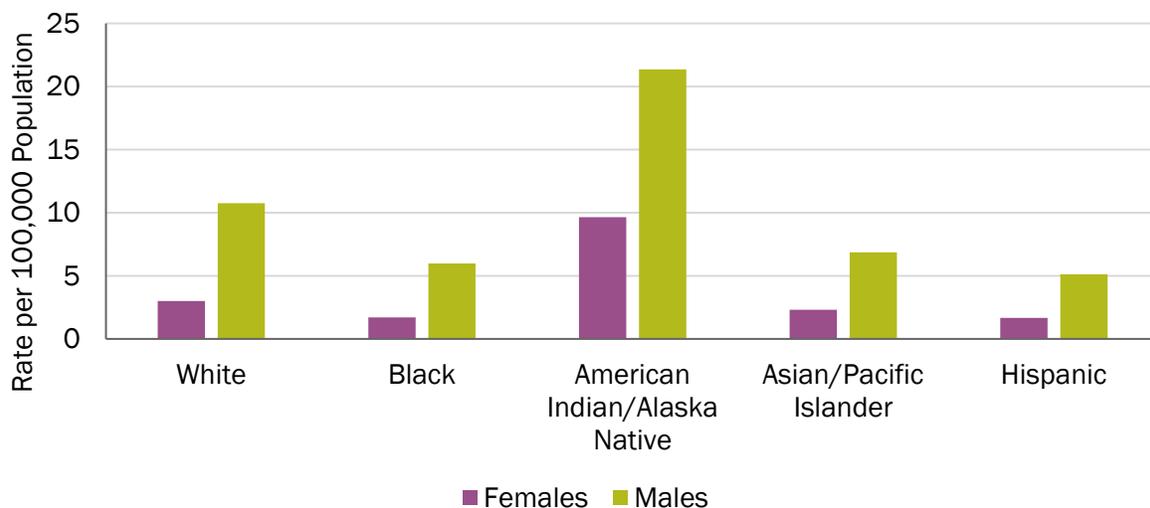


Source: National Center for Health Statistics (NCHS) Multiple Cause-of-Death Mortality Data (2015).

One reason for males' higher rate of injury fatalities is their higher rate of engaging in risky behaviors. For example, Shults and West (2015) found that although female youth did not use helmets more often than males, male youth rode all-terrain vehicles (ATVs) more often than females, leading to an increased risk of injury, especially when coupled with the lack of a helmet. Adolescents who participate in high-injury sports are 50% more likely to engage in nonmedical use of opioids; athletes in high-injury sports such as football and wrestling are more likely to use opioids (Veliz, Boyd, & McCabe, 2013). This nonmedical use of opioids often follows medical use of opioids related to an injury. In 2008, males constituted nearly 90% of those ages 18 years or younger who visited the emergency department (ED) for a firearm injury (Allareddy et al., 2012).

Among children and youth ages 24 and younger, the rate of suicide mortality in males is more than three times the rate in females, with 8.6 per 100,000 deaths in males versus 2.52 per 100,000 deaths in females (CDC, 2017). Suicide acts using firearms or hanging, which are more prevalent among males, have high case-fatality rates (percent of suicides that are fatal). The gender disparity in suicide mortality is observed across all racial/ethnic groups (Figure 2).

FIGURE 2. SUICIDE MORTALITY RATE PER 100,000 POPULATION AMONG MALES AND FEMALES AGES 0-24 IN THE U.S., 2015

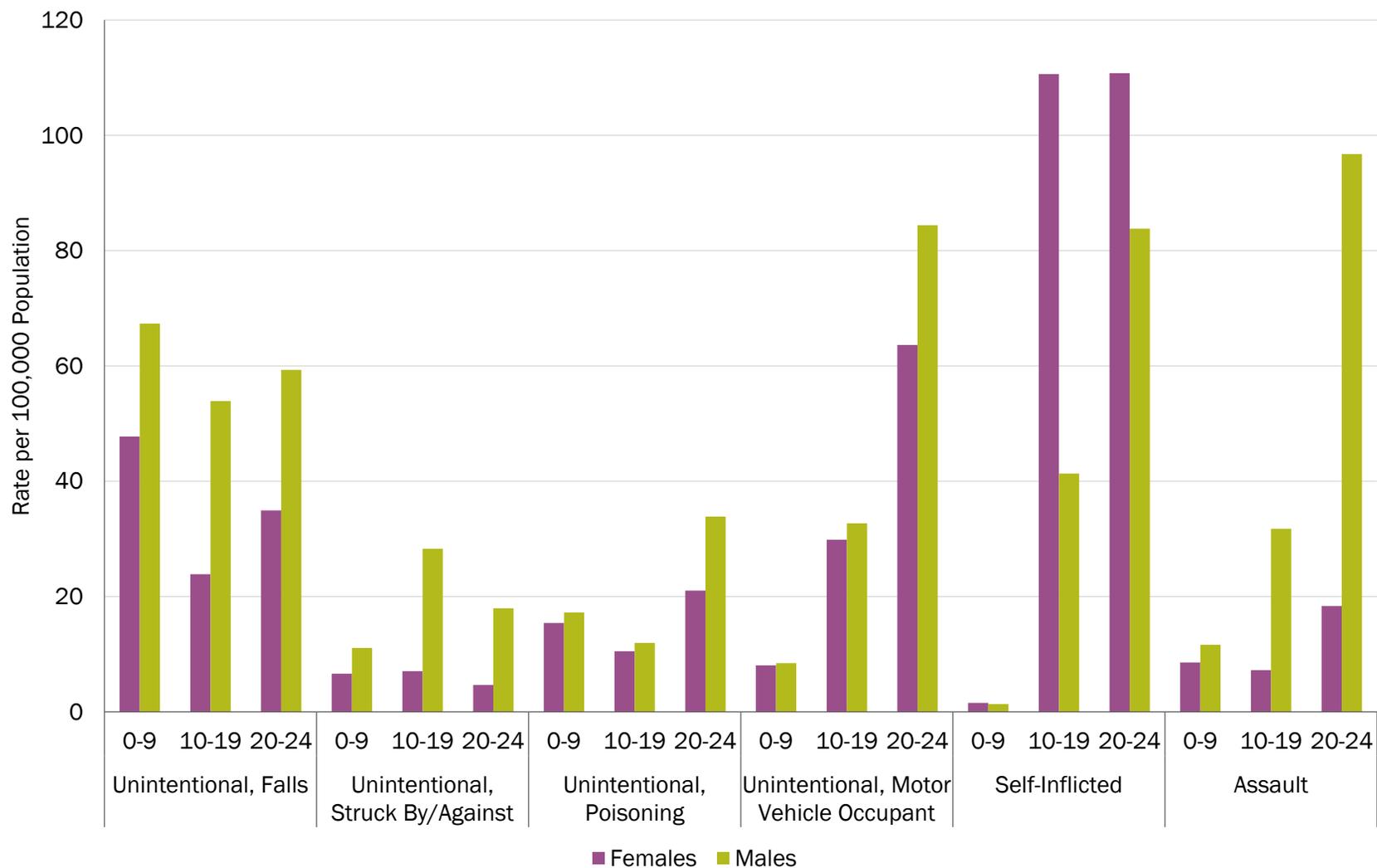


Source: Centers for Disease Control and Prevention (CDC) Web-based Injury Statistics Query and Reporting System (WISQARS; 2017).

Females. Although female and male adolescents ages 18 to 20 years are equally likely to be victims of violent crime, females are more often victims of sexual assault, while males are most often victims of simple assault (Child Trends, 2015). Sexual assault and victimization increase adolescent and young adult females' propensity towards depression, and eventually suicidal ideation (Kim et al., 2011).

Hospitalization rates resulting from suicide attempts are higher in adolescent females than in males (Bergen, Chen, Warner, & Fingerhut, 2008; Spicer & Miller, 2000), as suicide acts using poisoning and cutting/piercing methods are more common among females and have the lowest case-fatality rates. Figure 3 shows the rates of injury hospitalizations by sex for children and youth ages 0 to 9 years, 10 to 19 years, and 20 to 24 years. Note the rates of hospitalizations due to assault do not differentiate between physical and sexual assault.

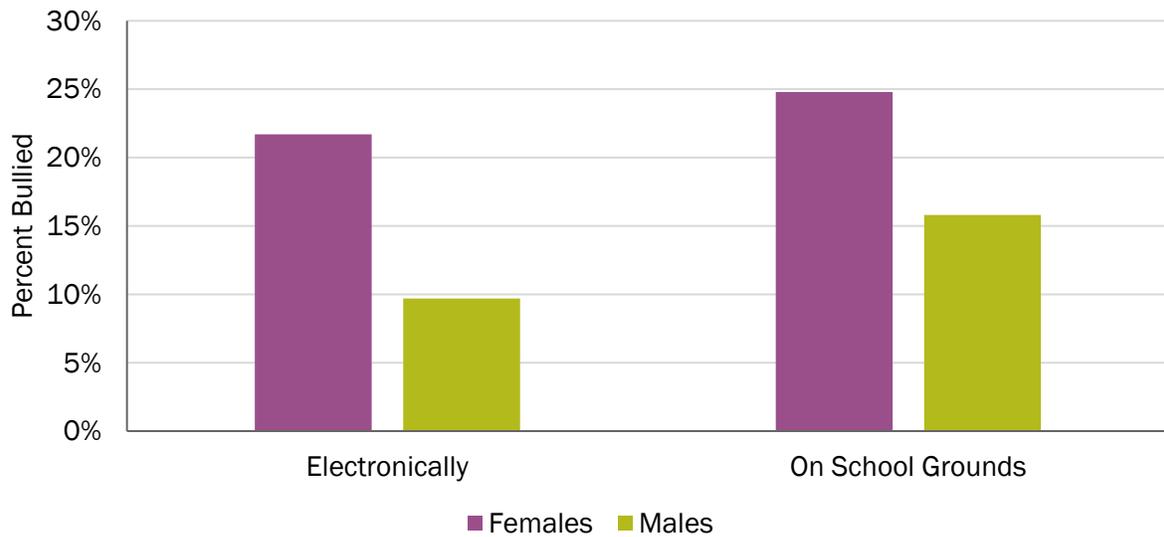
FIGURE 3. RATES OF INJURY HOSPITALIZATIONS PER 100,000 POPULATION, AGES 0-24 BY SEX, 2013



Source: Healthcare Cost Utilization Project (HCUP) Nationwide Inpatient Sample (2013).

In addition, girls are more likely than boys to report being bullied on school grounds and electronically. Figure 4 shows bullying victimization in females versus males.

FIGURE 4. PERCENT OF HIGH SCHOOL STUDENTS WHO REPORT BEING BULLIED, 2015



Source: Data from Youth Risk Behavior Survey, 2015 in Kann et al. (2016).

Sex differences are prevalent across injury types. Table 1 shows the rates and cost of injury hospitalizations by sex for ages 0 to 24 in 2013.

TABLE 1. RATE PER 100,000 POPULATION AND COST OF INJURY HOSPITALIZATION BY SEX, AGES 0 TO 24, 2013

| Leading Cause | Age Group | Females | | Males | |
|---------------------------------------|-----------|---------|-------------------------|-------|-------------------------|
| | | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) |
| Unintentional, Falls | 0-9 | 47.8 | \$8.00 | 67.4 | \$13.18 |
| | 10-19 | 23.9 | \$3.39 | 53.9 | \$9.61 |
| | 20-24 | 34.9 | \$2.30 | 59.3 | \$6.02 |
| Unintentional, Struck By/Against | 0-9 | 6.6 | \$1.17 | 11.1 | \$1.96 |
| | 10-19 | 7.0 | \$0.91 | 28.3 | \$4.50 |
| | 20-24 | 4.7 | \$0.29 | 18.0 | \$1.51 |
| Unintentional, Poisoning | 0-9 | 15.4 | \$0.05 | 17.2 | \$0.05 |
| | 10-19 | 10.5 | \$0.03 | 12.0 | \$0.05 |
| | 20-24 | 21.0 | \$0.05 | 33.9 | \$0.08 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 8.1 | \$1.49 | 8.5 | \$1.73 |
| | 10-19 | 29.9 | \$5.22 | 32.7 | \$6.92 |
| | 20-24 | 63.6 | \$5.16 | 84.4 | \$9.22 |
| Self-Inflicted | 0-9 | 1.5 | \$0.06 | 1.4 | \$0.11 |
| | 10-19 | 110.6 | \$1.74 | 41.3 | \$1.45 |
| | 20-24 | 110.8 | \$0.96 | 83.8 | \$1.72 |
| Assault | 0-9 | 8.6 | \$2.51 | 11.6 | \$3.78 |
| | 10-19 | 7.2 | \$0.89 | 31.7 | \$5.01 |
| | 20-24 | 18.3 | \$1.28 | 96.7 | \$8.33 |

Note: Cost of hospitalization in 2013 Dollars.

Source: HCUP Nationwide Inpatient Sample (2013).

The total cost in billions includes medical costs, work loss costs, and quality of life loss costs. Overall, the total cost of injury hospitalization for males (\$75.23 billion) is more than double the cost for females (\$35.49 billion). Disparities by sex are reflected in the cost when broken down by injury type. The rate of self-inflicted injury hospitalizations among females ages 10-19 years is more than double that of males of the same age group, which corresponds to higher cost of self-inflicted injury hospitalizations in females than males. The rate of assault injury hospitalizations among young adult males is more than five times that of young adult females, resulting in significantly higher assault injury hospitalization cost in males than females. Note, data on assault injury includes all types of assault and does not differentiate between physical and sexual assault.

TABLE 2. RATE PER 100,000 POPULATION AND COST OF INJURY DEATHS BY SEX, AGES 0 TO 24, 2015

| Leading Cause | Age Group | Females | | Males | |
|---------------------------------------|-----------|---------|-------------------------|-------|-------------------------|
| | | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) |
| Unintentional, Falls | 0-9 | 0.1 | \$0.12 | 0.2 | \$0.27 |
| | 10-19 | 0.1 | \$0.12 | 0.3 | \$0.56 |
| | 20-24 | 0.2 | \$0.17 | 1.2 | \$1.18 |
| Unintentional, Struck By/Against | 0-9 | 0.1 | \$0.21 | 0.1 | \$0.20 |
| | 10-19 | * | * | 0.1 | \$0.18 |
| | 20-24 | * | * | 0.3 | \$0.28 |
| Unintentional, Poisoning | 0-9 | 0.1 | \$0.23 | 0.1 | \$0.25 |
| | 10-19 | 1.1 | \$1.91 | 2.3 | \$4.12 |
| | 20-24 | 8.1 | \$7.22 | 20.6 | \$20.07 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 0.4 | \$0.67 | 0.5 | \$0.95 |
| | 10-19 | 1.5 | \$2.46 | 2.4 | \$4.24 |
| | 20-24 | 2.8 | \$2.48 | 6.5 | \$6.31 |
| Suicide | 0-9 | * | * | * | * |
| | 10-19 | 3.4 | \$5.61 | 8.4 | \$15.05 |
| | 20-24 | 5.5 | \$4.92 | 24.2 | \$23.63 |
| Homicide | 0-9 | 1.6 | \$2.59 | 2.3 | \$3.94 |
| | 10-19 | 1.3 | \$2.16 | 7.0 | \$12.55 |
| | 20-24 | 3.5 | \$3.15 | 23.8 | \$23.20 |

Note: Cost of death in 2015 Dollars.

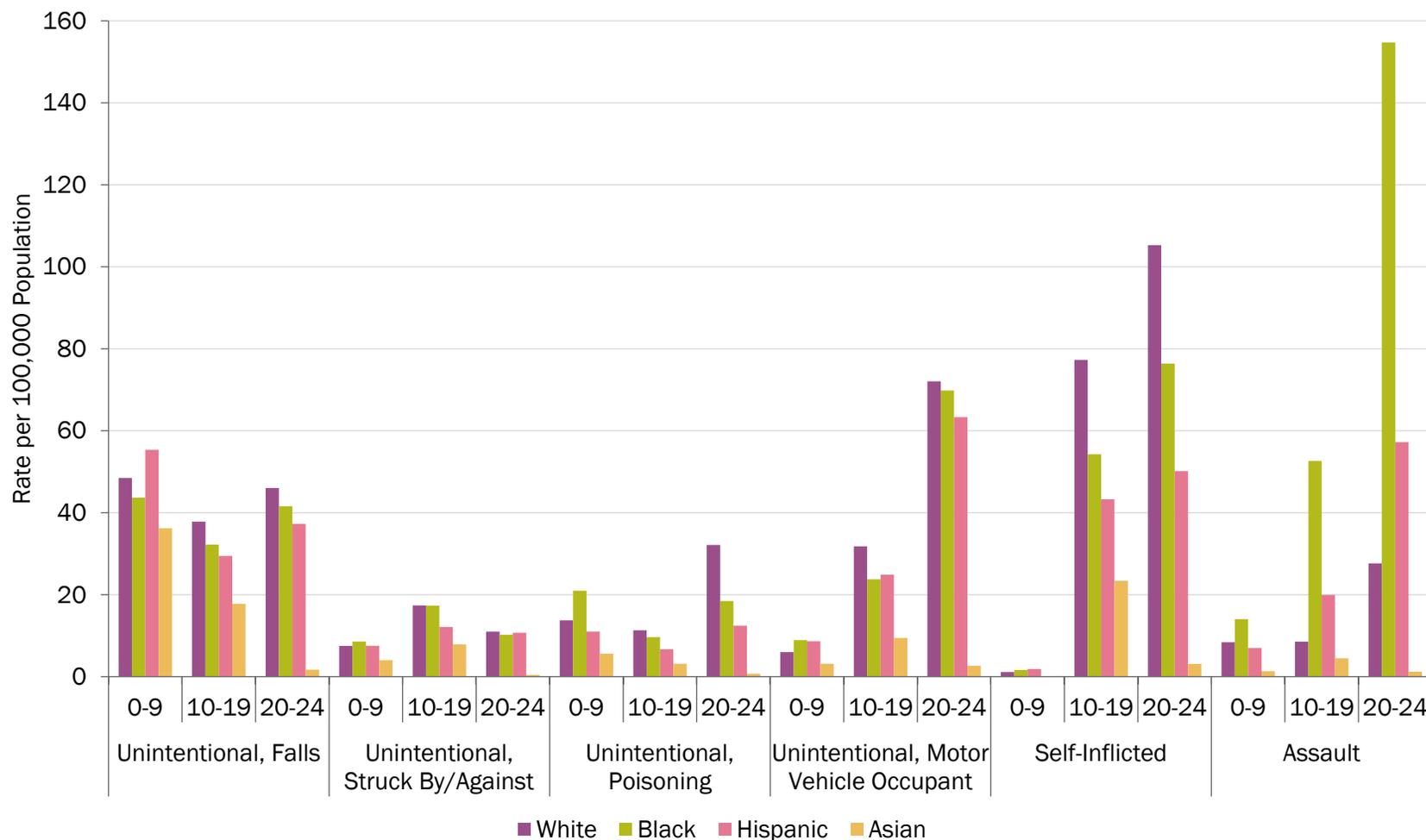
Source: NCHS Multiple Cause-of-Death Mortality Data (2015).

The total cost of injury deaths in males (\$117 billion) is more than triple the cost in females (\$34 billion). Death rates for drug poisoning, suicide, and homicide are higher in males compared to females, which are reflected in the cost of deaths caused by those injuries in males. Some injury disparities are noted by age group. Although hospitalization from unintentional falls is highest among 0-9 year old males and females, death rates from unintentional falls are highest in 20-24 year old males and females. As noted previously, hospitalization due to self-inflicted injuries is higher in females than males, while the suicide rate is higher in males than females.

Injury Disparities among Racial and Ethnic Groups

Much of the research on injury disparities in the U.S. focuses on racial and ethnic differences in injury rates. Racial and ethnic injury-related death and hospitalization rates vary widely by intent and mechanism of the injury. For example, Tyler and Melander (2009) found that having lower levels of education and being non-White increases the likelihood of not reporting assaults. The lack of information regarding assaults coupled with the lack of willingness to report and the lack of access, or perceived lack of access, to health care increase this possibility. Racial and ethnic disparities in the rate of injury hospitalizations and the rate of injury deaths for children and adolescents ages 10 to 19 years in 2013 are shown in Figure 5 and Figure 6, respectively.

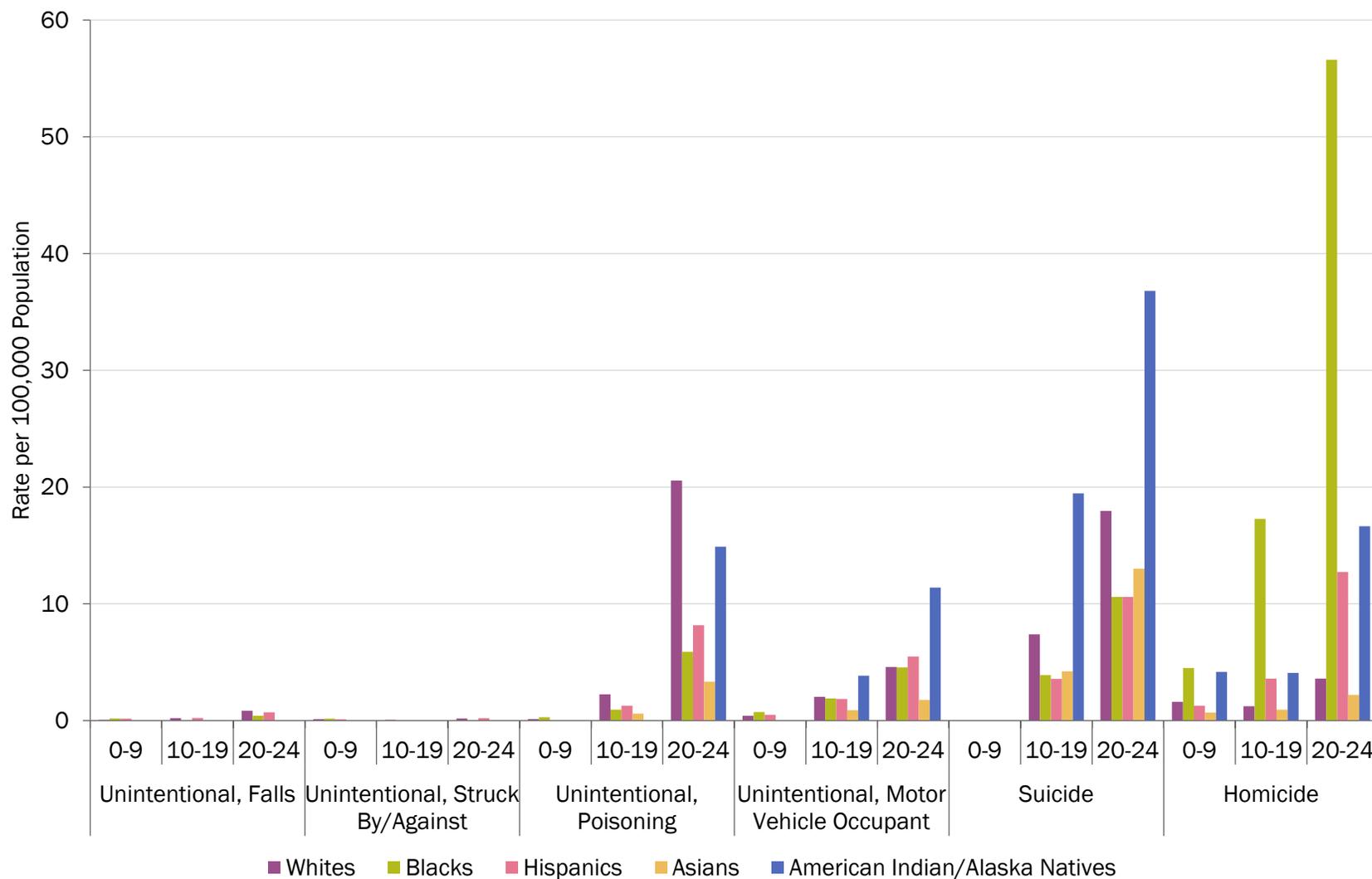
FIGURE 5. RATE OF INJURY HOSPITALIZATIONS PER 100,000 POPULATION FOR SELECT CAUSES BY RACE/ETHNICITY, AGES 0-24, 2013



Source: HCUP Nationwide Inpatient Sample (2013).

Note: American Indian/Alaska Native category not assessed due to underreporting of injuries in the HCUP National Inpatient Sample (NIS) database.

FIGURE 6. RATE OF INJURY DEATHS PER 100,000 POPULATION FOR SELECT CAUSES BY RACE/ETHNICITY, AGES 0-24, 2015



Source: NCHS [Multiple Cause-of-Death Mortality Data \(2015\)](#).

Self-inflicted injuries affect Whites and suicide affects American Indians/Alaska Natives much more than other groups for ages 10 to 24 years. Assault and homicides affect Blacks disproportionately across all ages. The following sections explore injury disparities by racial and ethnic group.

Blacks. One of the most striking population-based inequalities among 15 to 19 year old Black and Hispanic youth compared to White and Asian/Pacific Islander youth is the increased risk of homicide and assault (CDC, 2011a). Additionally, Black young adults are at an increased risk of suicide in their early 20s, peaking at age 24 for young Black men and in the late 20s for young Black women, compared with Whites, whose risk for suicide peaks later in life (Wang et al., 2016). A longitudinal study found a relationship between being a victim of assault and attempting suicide in low-income Black adolescents and young adults (Farrell, Bolland, & Cockerham, 2015; Suicide Prevention Resource Center, 2015).

Black children are at increased risk for fire/burn injuries, drowning, pedestrian injuries, and falls, and Black infants (< 1 year) are at greater risk of unintentional suffocation death than other racial/ethnic groups (Bernard et al., 2007). Black children and adolescents ages 5 to 19 years are 5.5 times more likely than White children and adolescents to drown in a swimming pool (Gilchrist & Parker, 2014).

American Indian/Alaska Natives (AI/ANs). In general, AI/ANs experience greater injury burden than Whites. In 2015, AI/AN children had a higher rate of unintentional injuries than their White counterparts, 11.6 versus 9.6 per 100,000, respectively (CDC, 2017). From 2006 to 2015, AI/ANs ages 10 to 19 years had the highest suicide rate among all racial and ethnic groups (CDC, 2017). In 2015, among individuals between the ages of 10 and 24 years old, AI/ANs experienced significantly greater suicide mortality (25.5 per 100,000) followed by Whites (11.1 per 100,000), Asian/Pacific Islanders (7.5 per 100,000), Blacks (6.3 per 100,000), and Hispanics (5.2 per 100,000) (CDC, 2017).

AI/AN infants from birth to 12 months are particularly susceptible to fatal motor vehicle traffic (MVT) injuries when compared with other racial groups (Bernard et al., 2007). Coupled with the physical isolation of many AI/ANs in the United States (U.S.), emergency medical services and regular health care services may be difficult to reach. For example, access to health care on a reservation is much more limited than access to health care in a town or city (Allison-Burbank, Hagen, Neenan, & Shull, 2017). Other social factors, such as poverty, unemployment, and lower education than Whites, also contribute to higher injury incidence in AI/ANs (Castor et al., 2006).

Whites. Whites ages 15 to 19 years have higher rates of combined suicide death and attempt than their Black, Asian/Pacific Islander, and Hispanic peers (CDC, 2011a). In addition, White adolescents use more substances, including prescription drugs, than other groups (Kim et al., 2011). The increase in abuse of prescription drugs (e.g., opioid

painkillers, psychotherapeutic drugs) by Whites has surpassed their use of illicit drugs in drug-related overdoses (CDC, 2011a). The increase in prescription drug abuse within White communities has led to an increase in overdoses, particularly in lower-income White communities (CDC, 2011a).

Hispanics. The injury mortality rate for Hispanic infants and children is lower than rates for other ethnicities (Rosenbaum & Blum, 2015). Some researchers have suggested that low language and cultural acculturation may be a protective factor in pediatric injury risk in Hispanic children (Schwebel & Brezausek, 2009). As families become more acculturated, their risk of injury seems to increase (Schwebel & Brezausek, 2009). However, injury disparities among racial and ethnic minority children occur not only at the point of injury but also in treatment and recovery from injury, which may be related to access to health care and parental health literacy (discussed in a later section). For example, Hispanic adolescents recovering from traumatic brain injury (TBI) are more likely to experience disability and to remain significantly impaired relative to Whites (Jimenez et al., 2013).

Asians, Native Hawaiians, and Pacific Islanders. Asian adolescents have the lowest rate of substance abuse and the lowest rate of suicidal ideation compared with other racial/ethnic groups (Kim et al., 2011). However, when considering specific subpopulations or locations, the patterns may vary.

Table 3 shows the rates and cost of injury hospitalization by race for ages 0 to 24 in 2013. In addition, Table 4 provides the rates and cost of injury deaths by race for ages 0 to 24 in 2015.

TABLE 3. RATE PER 100,000 POPULATION AND COST OF INJURY HOSPITALIZATION BY RACE, AGES 0-24, 2013

| Leading Cause | Age Group | White | | Black | | Hispanic | | Asian | |
|---------------------------------------|-----------|-------|-------------------------|-------|-------------------------|----------|-------------------------|-------|-------------------------|
| | | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) | Rate | Total Cost (in million) |
| Unintentional, Falls | 0-9 | 48.5 | \$9.59 | 43.7 | \$2.58 | 55.3 | \$4.89 | 36.2 | \$738.87 |
| | 10-19 | 37.8 | \$7.21 | 32.2 | \$1.45 | 29.4 | \$2.16 | 17.8 | \$352.09 |
| | 20-24 | 46.0 | \$4.69 | 41.6 | \$1.07 | 37.3 | \$1.31 | 1.7 | \$165.23 |
| Unintentional, Struck By/Against | 0-9 | 7.5 | \$1.31 | 8.6 | \$0.44 | 7.5 | \$0.68 | 4.0 | \$128.62 |
| | 10-19 | 17.4 | \$2.80 | 17.3 | \$0.70 | 12.1 | \$0.84 | 7.9 | \$166.74 |
| | 20-24 | 11.0 | \$1.03 | 10.2 | \$0.25 | 10.7 | \$0.33 | 0.4 | \$48.33 |
| Unintentional, Poisoning | 0-9 | 13.7 | \$0.03 | 21.0 | \$0.02 | 11.0 | \$0.02 | 5.6 | \$3.78 |
| | 10-19 | 11.3 | \$0.03 | 9.6 | \$0.02 | 6.7 | \$0.01 | 3.1 | \$10.16 |
| | 20-24 | 32.1 | \$0.08 | 18.5 | \$0.02 | 12.4 | \$0.01 | 0.7 | \$2.33 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 6.0 | \$1.28 | 8.9 | \$0.60 | 8.6 | \$0.84 | 3.1 | \$36.84 |
| | 10-19 | 31.8 | \$7.04 | 23.8 | \$1.38 | 24.9 | \$2.07 | 9.4 | \$182.04 |
| | 20-24 | 72.1 | \$8.10 | 69.8 | \$1.88 | 63.3 | \$2.25 | 2.6 | \$304.31 |
| Self-Inflicted | 0-9 | 1.1 | \$0.04 | 1.6 | \$0.04 | 1.9 | \$0.04 | * | * |
| | 10-19 | 77.3 | \$1.74 | 54.3 | \$0.43 | 43.3 | \$0.47 | 23.4 | \$43.58 |
| | 20-24 | 105.2 | \$1.58 | 76.4 | \$0.37 | 50.1 | \$0.36 | 3.1 | \$44.61 |
| Assault | 0-9 | 8.4 | \$2.83 | 14.0 | \$1.08 | 7.0 | \$0.97 | 1.3 | \$78.44 |
| | 10-19 | 8.5 | \$1.61 | 52.6 | \$2.21 | 19.9 | \$1.28 | 4.5 | \$65.34 |
| | 20-24 | 27.6 | \$3.02 | 154.7 | \$3.65 | 57.2 | \$1.80 | 1.2 | \$127.55 |

Note: Cost of hospitalization in 2013 Dollars. Asterisk denotes suppressed data for deaths <10.

Source: HCUP Nationwide Inpatient Sample (2013).

TABLE 4. RATE PER 100,000 POPULATION AND COST OF INJURY DEATHS BY RACE, AGES 0-24, 2015

| Leading Cause | Age Group | White | Black | Hispanic | Asian | American Indian/Alaska Natives |
|---------------------------------------|-----------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------------------|
| | | Total Cost (in billion) Rate | Total Cost (in billion) Rate | Total Cost (in billion) Rate | Total Cost (in million) Rate | Total Cost (in million) Rate |
| Unintentional, Falls | 0-9 | 0.1 \$0.14 | 0.2 \$0.09 | 0.2 \$0.14 | * * | * * |
| | 10-19 | 0.2 \$0.42 | * * | 0.2 \$0.18 | * * | * * |
| | 20-24 | 0.8 \$0.90 | 0.4 \$0.13 | 0.7 \$0.28 | * * | * * |
| Unintentional, Struck By/Against | 0-9 | 0.1 \$0.22 | 0.2 \$0.08 | 0.1 \$0.10 | * * | * * |
| | 10-19 | 0.1 \$0.15 | * * | * * | * * | * * |
| | 20-24 | 0.2 \$0.18 | * * | 0.2 \$0.08 | * * | * * |
| Unintentional, Poisoning | 0-9 | 0.1 \$0.22 | 0.3 \$0.15 | * * | * * | * * |
| | 10-19 | 2.3 \$4.33 | 0.9 \$0.49 | 1.3 \$1.03 | 0.6 \$0.12 | * * |
| | 20-24 | 20.6 \$21.62 | 5.9 \$1.74 | 8.2 \$3.26 | 3.3 \$0.39 | 14.9 \$0.28 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 0.4 \$0.74 | 0.7 \$0.37 | 0.5 \$0.43 | * * | * * |
| | 10-19 | 2.0 \$3.90 | 1.9 \$0.99 | 1.9 \$1.49 | 0.9 \$0.17 | 3.8 \$0.13 |
| | 20-24 | 4.6 \$4.83 | 4.6 \$1.35 | 5.5 \$2.19 | 1.8 \$0.21 | 11.4 \$0.21 |
| Suicide | 0-9 | * * | * * | * * | * * | * * |
| | 10-19 | 7.4 \$14.24 | 3.9 \$2.05 | 3.6 \$2.88 | 4.2 \$0.83 | 19.5 \$0.67 |
| | 20-24 | 18.0 \$18.96 | 10.6 \$3.15 | 10.6 \$4.23 | 13.0 \$1.52 | 36.8 \$0.70 |
| Homicide | 0-9 | 1.6 \$2.84 | 4.5 \$2.32 | 1.3 \$1.11 | 0.7 \$0.13 | 4.2 \$0.14 |
| | 10-19 | 1.2 \$2.36 | 17.3 \$9.10 | 3.6 \$2.91 | 0.9 \$0.18 | 4.1 \$0.14 |
| | 20-24 | 3.6 \$3.79 | 56.6 \$16.88 | 12.7 \$5.11 | 2.2 \$0.26 | 16.6 \$0.32 |

Note: Cost of deaths in 2015 Dollars. Asterisk denotes suppressed data for deaths <10.

Source: NCHS Multiple Cause-of-Death Mortality Data (2015).

Overall, the cost of injuries is highest in Whites (\$54.01 billion in hospitalization and \$79.84 billion in deaths). Hispanics have the second highest cost of injury hospitalization (\$20.54 billion). However, Blacks have the second highest cost of injury deaths (\$38.90 billion). As indicated in Tables 3 and 4 above, Blacks are disproportionately represented in injury hospitalizations and deaths resulting from assault and homicide at all ages. Self-inflicted injuries are highest among Whites and Blacks (in that order). The suicide rate is highest among American Indian/Alaska Natives. Ultimately, the rates of injuries affect the cost of treating such injuries in each community.

Role of Geography in Injury Disparities

Childhood injury rates are also influenced by geographic and environmental factors. Three of the most common injury disparities related to geography are drowning, climate/farming/agriculture-related injuries, and rurality (including assault, and suicide and self-harm). Children in Southern states experience higher rates of drowning fatalities than children who live in the Northeastern, Midwestern, or Western states (CDC, 2017). Children who live in more densely populated areas, or in multifamily units, that have pools have a higher risk of pool submersion than those who live in less densely populated areas, or in single family units, with pools (Shenoi et al., 2015). Children ages 1-4 are at higher risk for drowning in a swimming pool; whereas, children ages 5-19 have higher risk for drowning in natural water (Xu, 2014). This is important to consider in developing injury prevention strategies as a study by Irwin, Irwin, Ryan, & Drayer (2009) and colleagues found that the majority of Black/African-American and Hispanic youth have limited swimming abilities and are at greater risk for drowning.

Additionally, proximity to bodies of water coupled with incidences of wandering in children with autism increases their risk of drowning, especially in warmer months (McIlwain, & Fournier, 2012; National Autism Association, n.d., Autism Speaks, n.d.). Children who live in warmer climates experience a year-round increased risk of hyperthermia¹ after being left unattended in a vehicle as compared with children living in colder climates who are mostly at risk during the warmer months of the year (Duzinski et al., 2014).

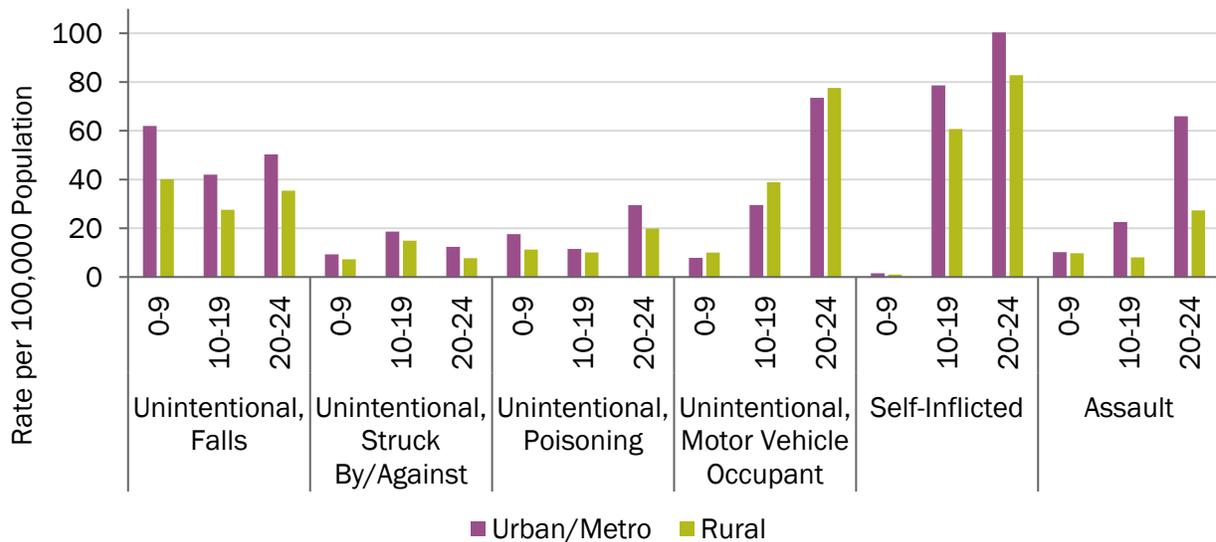
Overall, farming injuries are more common in rural areas. Farming injuries are experienced by three distinct groups: children who live on a farm, those who visit a farm, and youth who work on a farm (National Children's Center for Rural and Agricultural Health and Safety [NCCRAHS], 2017). A child or youth (0 to 19 years old) dies on a farm every three days, and approximately 33 children or youth sustain nonfatal injuries on farms every day (NCCRAHS, 2017). The top causes of farming deaths for all children and youth are machinery, motor

¹ Hyperthermia is defined as having an above normal body temperature.

vehicles, and drowning, while deaths of children and youth who work on farms are most often related to tractors and ATVs (NCCRAHS, 2017).

Regional differences in suicide mortality, secondary to gun violence, have also been observed, such that the rate of suicide mortality among individuals between the ages of 0 and 24 are higher in the Midwest (6.35 per 100,000) and West (6.29 per 100,000) than in the South (5.51 per 100,000) and Northeast (4.02 per 100,000) (CDC, 2017). In addition to the regional differences in suicide mortality, children and youth ages 10-24 in rural areas experience significantly greater suicide mortality than those in urban areas, controlling for county-wide variables (Fontanella et al., 2015). While rural areas have a higher rate of suicide, urban areas have a higher rate of homicide (Bergen et al., 2008). As Bergen et al. (2008) found, rural areas have less access to health care than urban communities, which may influence EMS response times and individuals' responses to injuries. Figure 7 below shows the rate of injury hospitalizations for select injury causes by age group for urban versus rural children.

FIGURE 7. RATE OF INJURY HOSPITALIZATIONS PER 100,000 POPULATION FOR SELECT CAUSES BY URBANIZATION, AGES 0-24, 2013



Source: HCUP Nationwide Inpatient Sample (2013).

Figure 7 above shows that across all age groups, urban/metro areas have higher injury hospitalization rates than rural areas, except for MVT injuries. Notably, hospitalization due to assaults in urban/metro areas are more than double that of rural areas among 10-19 year olds and 20-24 year olds.

Table 5 provides cost of injury hospitalization for select injury causes for urban/metro and rural children and youth ages 0-24.

TABLE 5. RATE PER 100,000 POPULATION AND COST OF INJURY HOSPITALIZATION BY URBAN STATUS, AGES 0-24, 2013

| Leading Cause | Age Group | Urban/Metro | | Rural | |
|---------------------------------------|-----------|-------------|-------------------------|-------|-------------------------|
| | | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) |
| Unintentional, Falls | 0-9 | 62.0 | \$18.32 | 40.1 | \$2.86 |
| | 10-19 | 42.0 | \$11.30 | 27.6 | \$1.72 |
| | 20-24 | 50.3 | \$7.19 | 35.4 | \$1.20 |
| Unintentional, Struck By/Against | 0-9 | 9.3 | \$2.63 | 7.3 | \$0.51 |
| | 10-19 | 18.6 | \$4.49 | 14.9 | \$0.93 |
| | 20-24 | 12.4 | \$1.51 | 7.7 | \$0.30 |
| Unintentional Poisoning | 0-9 | 17.6 | \$0.82 | 11.3 | \$0.01 |
| | 10-19 | 11.5 | \$0.68 | 10.1 | \$0.01 |
| | 20-24 | 29.5 | \$0.11 | 19.8 | \$0.01 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 7.8 | \$2.49 | 10.0 | \$0.72 |
| | 10-19 | 29.5 | \$9.31 | 38.9 | \$2.85 |
| | 20-24 | 73.5 | \$11.29 | 77.6 | \$3.14 |
| Self-Inflicted | 0-9 | 1.5 | \$0.14 | 1.0 | \$0.22 |
| | 10-19 | 78.6 | \$2.67 | 60.7 | \$0.52 |
| | 20-24 | 100.4 | \$2.25 | 82.8 | \$0.43 |
| Assault | 0-9 | 10.2 | \$4.93 | 9.7 | \$1.36 |
| | 10-19 | 22.6 | \$5.40 | 8.0 | \$0.53 |
| | 20-24 | 65.9 | \$8.65 | 27.3 | \$0.99 |

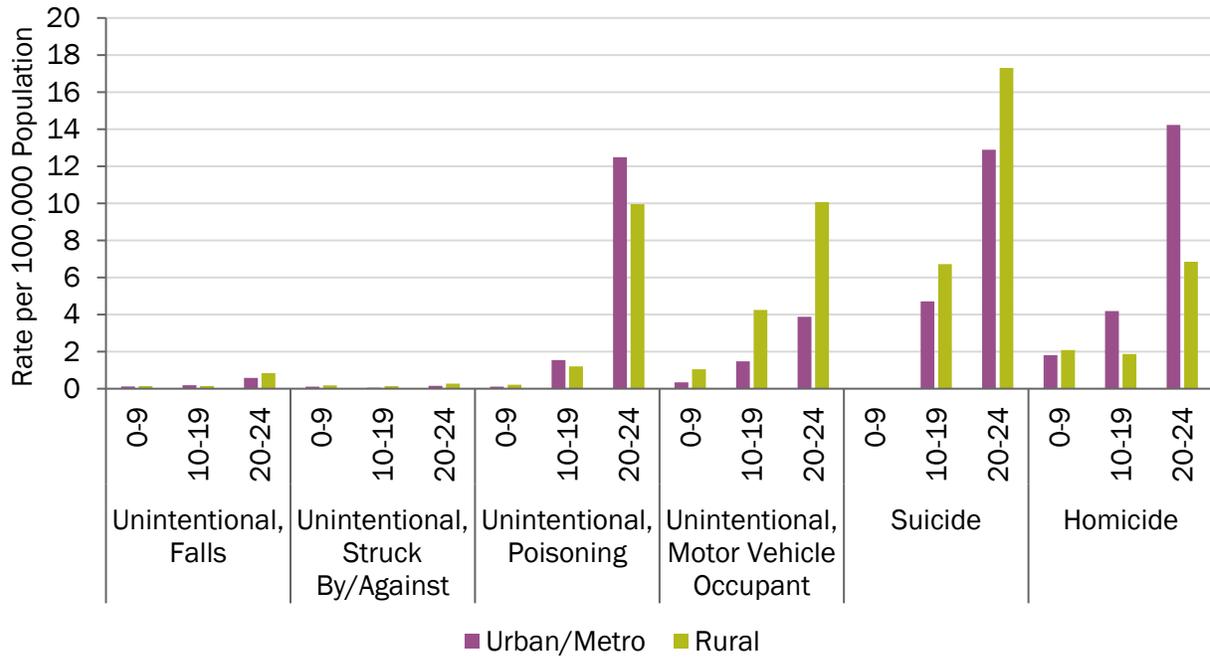
Note: Cost of hospitalization in 2013 Dollars.

Source: HCUP Nationwide Inpatient Sample (2013).

As shown in Table 5, the cost of injury hospitalization in urban/metro (\$92.84 billion) is five times that of rural (\$18.11 billion). In urban/metro areas, the highest cost of injury hospitalization is attributed to injuries from unintentional falls (\$36.81 billion) whereas the highest cost of injury hospitalization in rural areas is related to MVT injuries (\$6.71 billion).

Figure 8 indicates the rates of injury deaths for select causes by age group for urban versus rural children and youth ages 0-24.

FIGURE 8. RATE PER 100,000 POPULATION AND COST OF INJURY DEATHS FOR SELECT CAUSES BY URBANIZATION, AGES 0-24, 2015



Source: NCHS Multiple Cause-of-Death Mortality Data (2015).

Table 6 includes the rates and cost of injury deaths for select causes by age group for urban versus rural children.

TABLE 6. RATE PER 100,000 POPULATION AND COST OF INJURY DEATHS BY URBAN STATUS, AGES 0-24, 2015

| Leading Cause | Age Group | Urban/Metro | | Rural | |
|---------------------------------------|-----------|-------------|-------------------------|-------|-------------------------|
| | | Rate | Total Cost (in billion) | Rate | Total Cost (in billion) |
| Unintentional, Falls | 0-9 | 0.1 | \$0.32 | 0.1 | \$0.09 |
| | 10-19 | 0.2 | \$0.51 | 0.1 | \$0.10 |
| | 20-24 | 0.6 | \$0.86 | 0.8 | \$0.29 |
| Unintentional, Struck By/Against | 0-9 | 0.1 | \$0.30 | 0.2 | \$0.11 |
| | 10-19 | 0.1 | \$0.14 | 0.1 | \$0.09 |
| | 20-24 | 0.2 | \$0.23 | 0.3 | \$0.10 |
| Unintentional Poisoning | 0-9 | 0.1 | \$0.29 | 0.2 | \$0.14 |
| | 10-19 | 1.5 | \$4.17 | 1.2 | \$0.78 |
| | 20-24 | 12.5 | \$18.27 | 10.0 | \$3.49 |
| Unintentional, Motor Vehicle Occupant | 0-9 | 0.3 | \$0.89 | 1.1 | \$0.66 |
| | 10-19 | 1.5 | \$3.99 | 4.2 | \$2.74 |
| | 20-24 | 3.9 | \$5.68 | 10.1 | \$3.52 |
| Suicide | 0-9 | * | * | * | * |
| | 10-19 | 4.7 | \$12.76 | 6.7 | \$4.36 |
| | 20-24 | 12.9 | \$18.91 | 17.3 | \$6.08 |
| Homicide | 0-9 | 1.8 | \$4.72 | 2.1 | \$1.30 |
| | 10-19 | 4.2 | \$11.37 | 1.9 | \$1.21 |
| | 20-24 | 14.2 | \$20.95 | 6.8 | \$2.40 |

Note: Rate per 100,000 people. Cost of hospitalization in 2015 Dollars.

Source: NCHS Multiple Cause-of-Death Mortality Data (2015).

The cost of injury deaths in metro/urban areas (\$104.36 billion) is nearly four times that of rural areas (\$27.45 billion). The highest cost of injury deaths in urban/metro areas is due to homicide (\$37.04 billion). In contrast, the highest cost of injury deaths in rural areas is related to suicide (\$10.44 billion).

Injury Risk among Children with Certain Disabilities

More than 12% of the U.S. population has significant disabilities (Krahn, Walker, & Correa-De-Arraujo, 2015) and 7.8% of the civilian population with disabilities are children ages 17 and under (Stoddard, 2014). Disabilities can range from conditions that one is born with to disabilities resulting from injury or other health conditions (Krahn et al., 2015). Public health experts have recently argued that people with disabilities should be identified as a health disparity population, and the evidence supports this recommendation (Krahn et al., 2015). When looking at injury disparities among children with disabilities, the specific type of

disability should also be taken into account, as the rate ratios of unintentional injuries for individual disability groups are much higher than for the group as a whole when compared to the general population (Brenner et al., 2013).

Children with disabilities face a heightened risk of violence and unintentional injury compared with children without disabilities, and they face different types and levels of risks depending on their type of disability. For example, youth over four years of age with a single cognitive, physical, or emotional/behavioral disability are at increased risk of injury when compared with their counterparts without a disability (Sinclair & Xiang, 2008; Washington State Department of Health [WSDOH], 2009). Children with multiple disabilities are at an even greater risk of a school-related injury compared with children with one disability or no disability (Ramirez, Peek-Asa, & Kraus, 2004). In addition, children with attention deficit/hyperactivity disorder (ADHD) are at higher risk of sustaining head injuries, unintentional poisonings, and pedestrian injuries compared with children without ADHD (CDC, 2014; Stavrinou et al. 2011). For example, children with ADHD are less likely to process information appropriately when crossing the street, although they seem to follow the appropriate behavioral patterns (i.e., looking both ways, waiting for safe crossing) (Stavrinou et al., 2011). Children with disabilities are also less likely to wear seatbelts compared to those without disabilities (WSDOH, 2009). These examples suggest that interventions for children with disabilities require more than changing behavioral patterns as behaviors do not necessarily equate to an understanding of immediate danger. When controlling for other demographic variables, such as sex, age, socioeconomic status, and race, children with autism, ADD/ADHD, or psychopathology are “twice as likely to sustain an injury as their unaffected” counterparts (Lee, Harrington, Chang, & Connors, 2008).

In a study of adults with severe mental illness, a high proportion (56.7%) had experienced multiple categories of childhood abuse, which increased their risk of experiencing a head injury (Schneeberger et al., 2012). As a result, these individuals were more likely to need and visit emergency departments. In addition, youth ages 12 to 19 with disabilities are almost two times more likely to be victims of nonfatal violent crimes and more than twice as likely to be a victim of rape or sexual assault relative to people with no disability (Rand & Harrell, 2009).

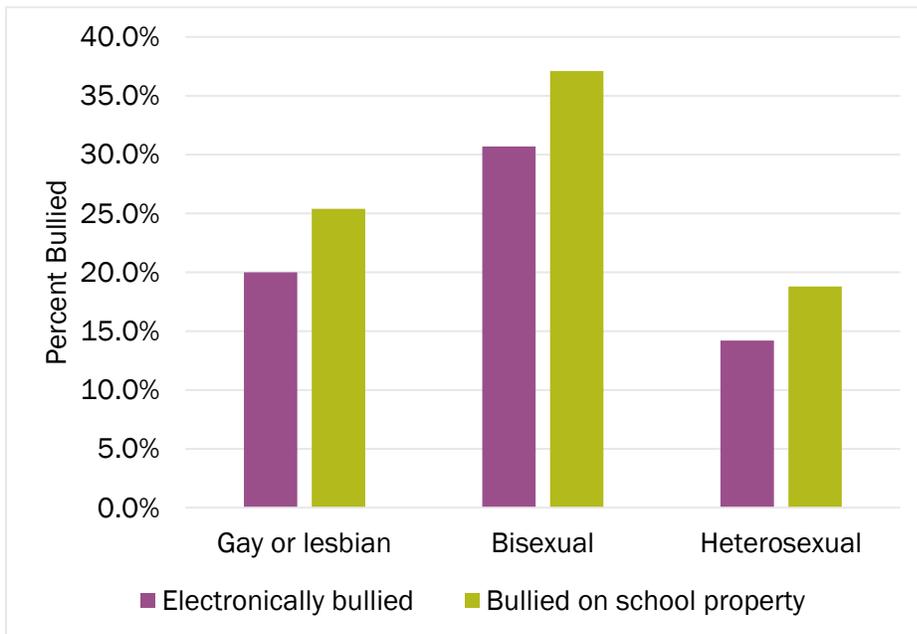
Children with significant disabilities, especially when their communicative abilities are affected, may not be able to report different forms of abuse or unintentional injury, which can decrease their ability to receive proper medical care and treatment until someone else notices the abuse or injury. Children younger than 15 years of age with autism experience a higher risk of death by unintentional injury from drowning, suffocation, and asphyxiation than their counterparts without autism (Guan & Li, 2017). A growing number of autism organizations are addressing the relationship among autism, increased propensity to wander, and drowning in children with autism (National Autism Association, n.d.; Autism Speaks, n.d.).

In youth ages 11 to 18 years with severe intellectual disabilities, an association was found between the absence of speech and an increase in self-injury and severe destructive behavior (Oliver et al.,2012). As such, there is a potential for higher comorbidity in children with significant disabilities. Developing strategies to engage parents and educators in safe practices through home-school-community partnerships is vital to the safety of children with disabilities. Identifying the signs of disability at an early stage and establishing support systems and supportive educational practices may also help alleviate disability-related injury disparities.

Risk of Intentional Injury among LGBTQ Populations

In 2016, the National Institutes of Health designated sexual and gender minorities (SGMs), which encompass lesbian, gay, bisexual, and transgender (LGBT) people, as a health disparities population for targeted research (Perez-Stable, 2016). Prior to this, sexual orientation items were largely absent from federal and state surveillance data, and individuals may not have wanted to identify as LGBT on surveys (Mustanski, Van Wagenen, Birkett, Eyster, & Corliss, 2014). However, the absence of data does not indicate an absence of injury incidence. LGBTQ populations are at increased risk of engaging in suicidality (e.g., suicide plan, suicide attempt, medically-treated attempt), up to more than double the risk of heterosexuals (Kann et al, 2016b; Bontempo & D'Augelli, 2002). In addition, LGBTQ youth have an increased risk for non-suicidal self-injury compared with their non-LGBTQ counterparts (Reisner et al., 2014). Further evidence shows elevated risks of bullying and assault, particularly while at school among LGBTQ youth compared with non-LGBTQ youth (D'Augelli et al.,2002).

FIGURE 9. PERCENT OF GAY, LESBIAN, OR BISEXUAL HIGH SCHOOL STUDENTS WHO REPORTED BEING BULLIED, COMPARED TO THEIR HETEROSEXUAL PEERS, 2015

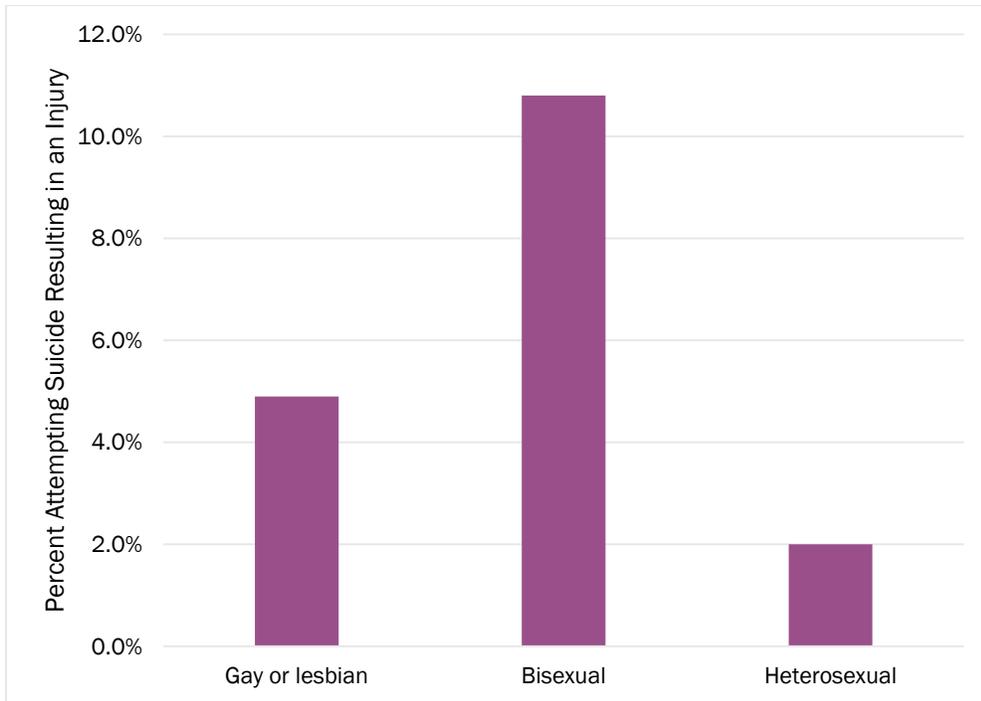


Source: Youth Risk Behavior Survey, 2015

Bullying and assault increase the likelihood of young LGBTQ males (as compared to LGBTQ females) experiencing long-term depression and suicidal ideation into their late adolescence and early adulthood, and engaging in self-harm and high-risk sexual behavior (Russell et al., 2011).

Furthermore, in an exploration of socio-ecological factors that contribute to suicidality among LGBT youth, an association was found between living in neighborhoods with higher levels of hate crimes (threat, harassment, assault, and battery) against LGBT individuals and increased risk of suicidality and suicidal ideation among LGBT adolescents, as compared to their heterosexual peers (Duncan & Hatzenbuehler, 2014).

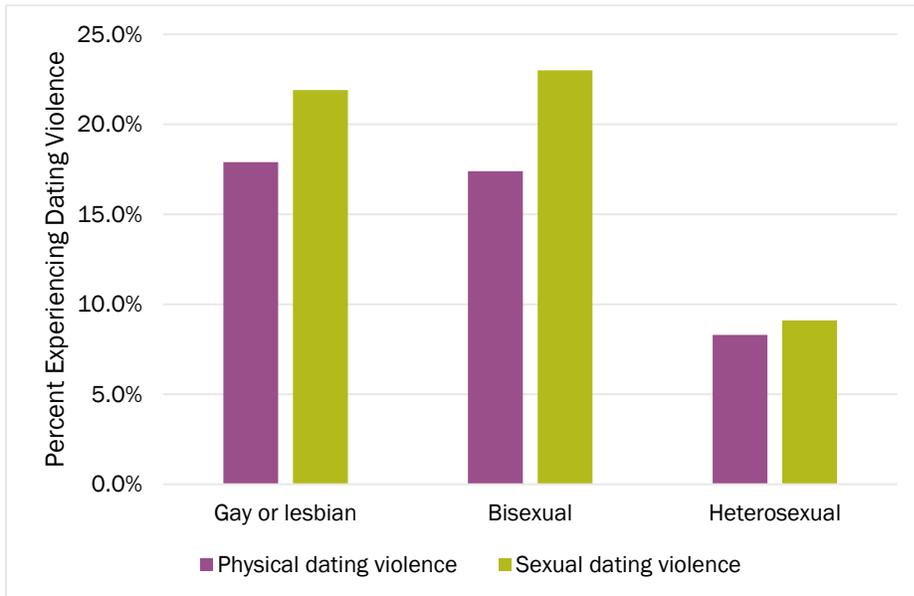
FIGURE 10. PERCENT OF GAY, LESBIAN, OR BISEXUAL HIGH SCHOOL STUDENTS WHO REPORTED AN ATTEMPTED SUICIDE THAT RESULTED IN AN INJURY, POISONING, OR OVERDOSE THAT HAD TO BE TREATED BY A DOCTOR OR NURSE, COMPARED TO THEIR HETEROSEXUAL PEERS



Source: Youth Risk Behavior Survey, 2015

Similarly, sexual minority youth are more likely to experience physical dating violence than their non-minority peers and may be less likely to report that violence as it would identify them as sexual minorities, although it is unclear to what extent youth may be underreporting (Luo et al.,2014).

FIGURE 11. PERCENT OF GAY, LESBIAN, OR BISEXUAL HIGH SCHOOL STUDENTS WHO REPORTED EXPERIENCING PHYSICAL OR SEXUAL DATING VIOLENCE AS COMPARED TO THEIR HETEROSEXUAL PEERS

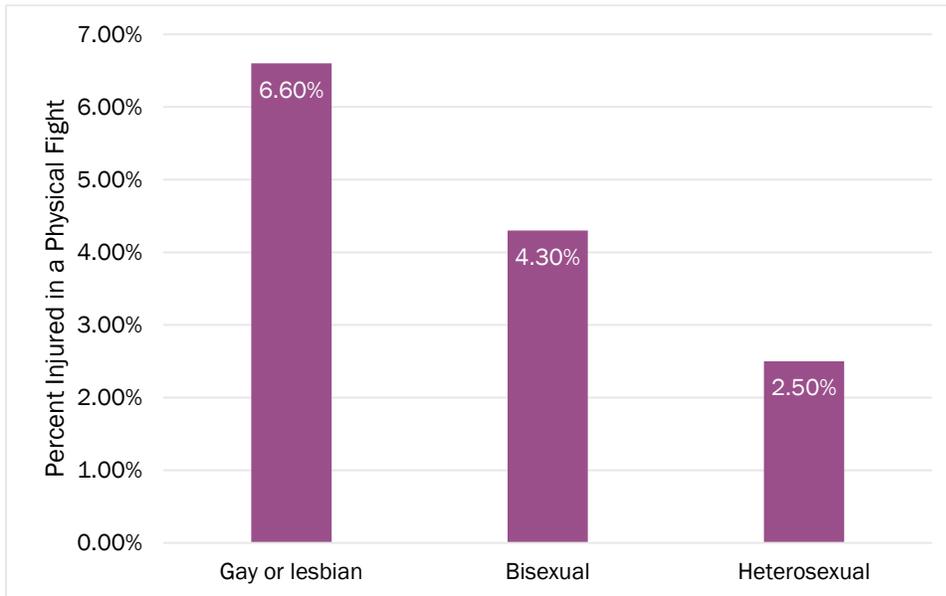


Source: Youth Risk Behavior Survey, 2015

Thus, when addressing injury disparities affecting LGBT adolescents, it is necessary to explore not just the actual acts of bullying and violence against LGBT individuals and groups, but the threat of hate crimes in the surrounding community and the community's responsiveness to those threats.

High school students who are lesbian, gay, and bisexual (LGB) or not sure of their sexual orientation experience a wide range of injury risks and disparities relative to heterosexual students (CDC, 2016; Kann et al., 2016b); those not sure of their sexual orientation often report the highest engagement in risk behaviors (Kann et al., 2016b). LGB and not-sure students are more likely to be bullied, involved in physical fights, and injured in physical fights relative to heterosexual students.

FIGURE 12. PERCENT OF GAY, LESBIAN, OR BISEXUAL HIGH SCHOOL STUDENTS WHO REPORTED BEING INJURED IN A PHYSICAL FIGHT COMPARED TO THEIR HETEROSEXUAL PEERS



Source: Youth Risk Behavior Survey, 2015

LGB and not-sure students also have elevated risk for substance abuse compared with heterosexual students (CDC, 2016), which is known to be associated with increased risk of suicidality and unintentional injury. Additionally, research on bullying victimization demonstrates increased health risk behaviors in adolescents (Hertz, Everett Jones, Barrios, David-Ferndon, & Holt, 2015).

There are a number of risk factors for violence, including strict beliefs about masculinity and femininity (Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Because the majority of bullying and violence towards LGBT youth happens in school environments, the politics of sexual orientation should be separated from the ability to protect youth in our schools and communities (Russell et al., 2011). A number of suggestions for preventing intentional and unintentional injuries in LGBT children have been proposed, such as creating school and community policies that “promote safe climates for all students in schools” (p. 229), anti-harassment, anti-discrimination, anti-bullying policies, as well as creating safe spaces for children to discuss and receive information about their experiences (Russell et al., 2011).

Relationship between Health Literacy and Injury Risk

Health literacy refers to the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (U.S. Department of Health and Human Services, 2000; Ratzan & Parker, 2000). There are increased risks of unintentional injuries to the children of caregivers who have limited health literacy and access to information. Caregivers with low or limited health literacy are less effective in preventing injuries and responding to emergencies affecting their children than caregivers with high health literacy (Sanders et al.). In a study of how mothers with young children access information on injury prevention, those who self-reported low health literacy and low e-health literacy (the ability to find health-related information on the Internet) were more likely to get information on injury prevention from other sources, such as doctors or friends, than to find information on their own (Manganello, Falisi, Roberts, Smith, & McKenzie, 2016). Overall, mothers received a lot of their information from the Internet. One possible response to this finding is to increase the accessibility of research on injury prevention by making more research publicly available on the Internet (and in smartphone adaptable formats) in non-academic language (Manganello et al., 2016).

In addition, individuals who have limited literacy in English, regardless of their primary language, may have difficulty reading or understanding warning or drug labels, safety instructions, or other information related to injury prevention, compared with those with higher English literacy levels (Sanders et al., 2009; Davis et al., 2006). Decreasing injury disparities depends on individuals, such as parents with low literacy or low health literacy, receiving the best information to keep their children safe, including providing child safety information during wellness visits (Manganello et al., 2016) and creating targeted school-community-health partnerships to engage parents, provide information, and coach parents through the process of making changes in their homes to improve safety. For instance, a longitudinal program was created for Spanish-speaking minority parents in Texas to address limited health literacy and a language barrier to accessing information (Setien et al., 2014). Providing information in Spanish and repeated follow-up phone calls with parents in Spanish led to an increase in participants' understanding of child safety and injury prevention practices (Setien et al., 2014).

There are also potential barriers to both health literacy and access to information in immigrant and/or non-English speaking populations. However, in a study of immigrants and their children, contrary to expectations, language acculturation (that is, using more English in the home) was an indicator of pediatric and adolescent injury risk when controlling for child's place of birth; those with lower language acculturation were more protected from injury than those who spoke English (Schwebel & Brezausek, 2009). Parents and children who use more English in the home may participate in more activities outside of the home, such as sports, driving, and so forth where injuries can occur. This suggests that the

majority, English-speaking culture and other factors may be greater indicators of injury risk than the lack of English spoken in the home (Schwebel & Brezaussek, 2009).

Health literacy is not only a parental characteristic; it is equally important for children to be engaged in health literacy and injury prevention. In a multi-tiered intervention in an urban school district with K-12 students and their parents, students improved in a number of areas after in-school workshops, including workshops on pedestrian and motor vehicle safety (Bachman et al., 2015). During two training sessions, parent participants received training on how to correctly install and use child safety seats (including booster seats) in their cars, which they demonstrated following the second training. Additionally, they were provided with proper child restraints if they did not have them or did not have the correct type of restraint. Efforts should be made to increase health literacy among parents to help them keep their children safe, as well as among children who can practice pedestrian safety and motor vehicle safety in their communities.

Injuries Inversely Correlated with Socioeconomic Status

Children from low SES backgrounds are at higher risk of infant mortality (Rosenbaum & Blum, 2015), drowning, and suffering assault or fall-related injuries relative to children from high SES backgrounds (Birken & MacArthur, 2004). Children in the lowest SES groups experience two times the mortality rate and 2.6 to 2.8 times the unintentional injury/homicide rate of children in higher SES groups (Singh & Kogan, 2007). The mortality and morbidity rates of children are influenced by access to health care, nutrition, living conditions, and vehicle safety, among others (Singh & Kogan, 2007). In a meta-analysis of socioeconomic inequality and unintentional injuries, lower income areas were associated with higher rates of burns (Laflamme, Hasselberg, & Burrows, 2010). Access to safe housing conditions is also a concern in lower SES communities where owner-occupied buildings mediate other community characteristics, but do not prevent childhood injury on an individual level (Shenassa, Stubbendick, & Brown, 2004). This finding indicates that a multilevel approach should be taken to understanding injury disparities in lower SES communities.

In a study on AI/ANs, the combination of having access to 1) safety items (such as child safety seats); 2) parental education on how to use those items properly; and, 3) community education on why the use of these items should be encouraged in the community were key to the implementation, success, and continuation of the program (Letourneau et al., 2008). Studies on child passenger safety have shown that the use of child safety seats (infant and booster seats) is related to one's ability to pay for them (Letourneau et al., 2008). Accordingly, a number of programs have attempted to address injury disparities by providing child safety seats and education on proper use of the seats to parents who would otherwise not be able to afford, or not know about, these products.

Injury disparities related to low SES and limited access to safe(ty) products affect a child's safety as the child develops. There are rising rates of socioeconomic disparities in traffic injuries, falls, and burns for adolescents ages 15 to 19 years, despite an overall decrease in these types of injuries (Mytton, Towner, Powell, Pilkington, & Gray, 2012). For example, motor-vehicle related deaths among youth are more common among those who drive smaller, cheaper, and older vehicles without important safety features (e.g., electronic stability control, side air bags), compared with middle-aged drivers (McCartt & Teoh, 2014). This particular issue may be influenced by the tendency of young people to buy their own cars (cars they can afford as teenagers) or drive older family vehicles. County-level poverty is associated with risk of unintentional injury mortality, including fatal MVT crashes, poisoning, drowning, and fire/smoke exposure (Karb et al., 2016).

Although empirical data linking youth homelessness to increased mortality risk are limited, about 5,000 homeless youth die each year due to suicide, assault, or illness (Safe Horizon, n.d.). Many homeless youth have left their homes to escape abuse and, as a result, are unable to adequately recognize, label, address, and seek help for assaults they may experience on the street (Tyler & Melander, 2009).

Trends in childhood injury mortality indicate that while children from SES backgrounds experienced large decreases in childhood mortality between 1969 and 2000, children from lower SES backgrounds did not experience decreases at the same rates, indicating widening socioeconomic disparities in childhood mortality in the U.S. during this time (Singh & Kogan, 2007). In particular, socioeconomic disparities in suicide rates widened from 1969 to 2000. Some evidence shows that the risk for suicide is greater in low SES areas than in the general population. However, this relationship does not appear in all racial groups (e.g., African Americans; Purselle, Heninger, Hanzlick, & Garlow, 2009).

Conclusions and Recommendations

Challenges remain to fully understanding why disparities in child and adolescent injury rates exist but, clearly, there is a need for action to reduce and eliminate these disparities. Despite decreases in child and adolescent injuries, there are still widening disparities across races, ethnicities, and socioeconomic status in the U.S. (Mytton et al., 2012). The evidence for effective and promising programs to reduce the toll of injuries is growing. However, the need persists for targeted interventions, cultural competency, and other approaches to address injury disparities.

The socioecological model (CDC, 2015; Dahlberg & Krug, 2002) can help us understand the multiple factors that contribute to injury disparities, and it may provide a useful framework for designing interventions that can address these disparities. Injury prevention approaches must take into consideration the influence of individuals, relationships, communities, and the broader society in order to successfully address the factors that cause and contribute to child and adolescent injury disparities.

For example, sex-based injury disparities may result from a number of societal, community, and relationship factors. From sociocultural gender norms to the pressures of adolescent development to the way adolescents are viewed as a group, the stressors on the individual male or female adolescent may make suicidal ideation, suicide attempts, and completed suicides more likely. Thus, an approach that targets only gender is not enough; approaches must also address mental health, relationship building, and other factors in the life of the adolescent. Increased opportunities for participation in evidence-based social and emotional learning programs and curricula, expanded use of evidence-based curricula that increase the likelihood of help-seeking behaviors, strengthening connections with caring and responsible adults, and increased availability of screening and treatment for mental health issues that appear during this stage of development can all help to guide adolescents' developing beliefs and attitudes toward a supportive community environment and away from suicidal thoughts and behaviors.

Very little of the research that we found examines how different kinds of risks and different kinds of disparities influence one another. For example, Fontanella et al. (2015) explored the intersection of race and SES in youth suicides. More research is needed to explore these connections. An individual child may face a disparity based on race, another based on geography, and another based on gender, which increases the child's risk for injury compared to a child who belongs to only one at-risk group. For instance, many of the disparities based on geography are also influenced greatly by SES and health literacy, but in the research that we found the relationship between geography and SES has not yet been addressed. In addition, a lack of uniform terminology and definitions of groups affected by injury disparities prevents complete comparison across subgroups and makes it more difficult to examine the impact of membership in multiple at-risk groups.

Input from the affected communities is necessary to develop and implement effective injury prevention interventions that will reduce disparities. For example, parents' observations of wandering behavior and insights into when and where this behavior occurs may help to inform the development of interventions to prevent drowning and other injuries in children with autism. Researchers must find ways to incorporate community perspectives into the development of new research studies to improve our understanding and ability to successfully address injury disparities.

Appendix 1

The references for this white paper were found through the Centers for Disease Control and Prevention's publications and online using EBSCO and accessing all available research databases. Only U.S.-based or comparative articles that contained significant information about the U.S. context were included. Search terms included injury disparities, child OR adolescent OR youth OR teenager (and other terms for young people), injury prevention, and the individual characteristics discussed in this paper, such as gender, socioeconomic status, race, ethnicity, health literacy, literacy, LGBTQ (and all associated terms), geography. For the majority of search terms, the date range was between 2007 and 2017. However, in searches that did not return many items, articles were read and search terms and date ranges were revised based on information from those articles. Only peer-reviewed, full-text available articles were cited. Additional sources were cited from organizations where research studies could not be located (e.g. autism, wandering, and drowning). See Figure 9 for the references cited by disparity and subgroup discussed.

FIGURE 13. REFERENCES CITED BY DISPARITY AND SUBGROUP DISCUSSED

| Sex | Race & Ethnicity | Geography | Disability | LGBTQ | Health Literacy | SES |
|--|---|---|--|---|--|---|
| <ul style="list-style-type: none"> • Males • CDC, 2011a • Allareddy et al., 2012 • Shults & West, 2015 • Veliz, Boyd, & McCabe, 2013 • CDC, 2017 • Females • Child Trends, 2015 • Kim et al., 2011 • Begen, Chen, Warner, & Fingerhut, 2008 • Spicer & Miller, 2000 • Kann et al., 2016a | <ul style="list-style-type: none"> • Tyler & Melander, 2009 • Healthcare Utilization Project, 2013 • Blacks • CDC, 2011a • Wang et al., 2016 • Farrell et al., 2015 • SPRC, 2015 • Bernard, Paulozzi, & Wallace, 2007 • Gilchrist & Parker, 2014 • American Indian/Alaska Native • CDC, 2017 • Bernard et al., 2007 • Allison-Burbank, et al., 2017 • Whites • CDC, 2011a • Kim et al., 2011 • Hispanics • Rosenbaum & Blum, 2015 • Schwebel & Brezausek, 2009 • Jimenez et al., 2013 • Asians, Native Hawaiians/Pacific Islanders • Kim et al., 2011 • CDC, 2017 | <ul style="list-style-type: none"> • Water/Climate • CDC, 2011b • Shenoj et al., 2015 • Irwin et al., 2009 • McIlwain & Fournier, 2012 • Autism Speaks, n.d. • National Autism Association, n.d. • Duzinski et al., 2014 • Agriculture/Rural • NCCRAHS, 2017 • CDC, 2017 • Fontanella et al., 2015 • Bergen et al., 2008 • Allareddy et al., 2007 • Peek-Asa et al., 2004 • Peek-Asa et al., 2009 | <ul style="list-style-type: none"> • Krahn, Walker, & Correa-De-Arraujo, 2015 • Stoddard, 2014 • Brenner, Taneja, Schroeder, Trumble, Moyer, & Louis, 2013 • Sinclair & Xiang, 2008 • WSDOH, 2009 • Ramirez et al., 2004 • CDC, 2014 • Stavrinou et al., 2011 • Lee et al., 2008 • Schneeberger et al., 2012 • Rand & Harrell, 2009 • Guan & Li, 2017 • National Autism Association, n.d. • Autism Speaks, n.d. • Oliver, Petty, Ruddick, & Bacarese-Hamilton, 2012 | <ul style="list-style-type: none"> • LGBT • Mustanski et al., 2014 • LGBTQ • Kann et al., 2015 • Bontempo & D'Augelli, 2002 • Reisner et al., 2014 • D'Augelli et al., 2002 • Duncan & Hatzenbeuhler, 2014 • Luo, Stone, & Tharp, 2014 • LGB • CDC, 2016 • Kann et al., 2015 • Hertz et al., 2015 • Wilkins et al., 2014 • Russell et al., 2011 | <ul style="list-style-type: none"> • U.S. Department of Health and Human Services, 2000 • Ratzan & Parker, 2000 • Low Health Literacy • Sanders, Shaw, Guez, Baur, & Rudd, 2009 • Manganello, Falisi, Roberts, Smith, & McKenzie, 2016 • Limited Literacy • Davis et al., 2006 • Setien, Han, Zuniga, Mier, Lucio, & Trevino, 2014 • Schwebel & Brezausek, 2009 • Bachman et al., 2015 | <ul style="list-style-type: none"> • Karb et al., 2016 • Singh & Kogan, 2007 • Purselle, Heninger, Hanzlick, & Garlow, 2009 • Birken & MacArthur, 2004 • Laflamme, Hasselberg, & Burrows, 2010 • Shenassa, Stubbendick, & Brown, 2004 • Letourneau et al., 2008 • Safe Horizon, n.d. • Tyler & Melander, 2009 • Mytton et al., 2012 • McCartt & Teoh, 2014 |

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