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Characteristics of School-Associated Youth Homicides — United States, 1994–2018

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To understand trends and characteristics in school-associated homicides involving youths, data from CDC's School-Associated Violent Death Surveillance System were analyzed for 393 single-victim incidents that occurred during July 1994–June 2016 and 38 multiple-victim incidents (resulting in 121 youth homicides) during July 1994–June 2018. School-associated homicides consistently represent <2% of all youth homicides in the United States (*1*,*2*). The overall 22-year trend for single-victim homicide rates did not change significantly. However, multiple-victim incidence rates increased significantly from July 2009 to June 2018. Many school-associated homicides, particularly single-victim incidents, are similar to youth homicides unrelated to schools, often involving male, racial/ethnic minority youth victims, and occurring in urban settings. The majority of both single-victim (62.8%) and multiple-victim (95.0%) homicides were from a firearm-related injury. A comprehensive approach to violence prevention is needed to reduce risk for violence on and off school grounds.

The School-Associated Violent Death Surveillance System tracks lethal violence in school settings, providing a census of violent deaths (i.e., homicides, suicides, and legal intervention deaths) in school environments. Incidents are identified through a systematic media scan of computerized newspaper and broadcast media databases via LexisNexis (https://www.lexisnexis.com/) using keywords such as "shooting, death, violent, strangulation, beating, attack, stabbing, and died" combined with phrases including "primary or secondary or elementary or junior or high or middle or during or after or grounds or property or playground." Cases include incidents where a fatality occurred 1) on a functioning public or private primary or secondary school campus in the United States; 2) while the victim was on the way to or from regular sessions at such a school; or 3) while the victim was attending or traveling to or from an official school-sponsored event. This study analyzed data for single-victim homicides during July 1994–June 2016 and multiple-victim incidents during July 1994–June 2018.*

Incidents involved the homicide of at least one youth† aged 5–18 years, but could also include nonstudent (e.g., school staff

* Approximately 36,000 news articles per school year are reviewed in the media scan to identify an average of 50 potential single-victim cases annually. The validation of cases and access to incident data creates data lags. Manual Internet searches using phrases such as "school shooting" and "multiple victims and school" and web-based firearm injury data sets (i.e., Everytown for Gun Safety and the Gun Violence Archive) enhance the validation process and facilitate access to incident data for multiple-victim incidents. The overall process resulted in data currently being available for single-victim incidents through June 2016 and multiple victim incidents through July 2018.

† Although all incidents in this study involved school-aged youths, some youths might not have been enrolled as students in a school.

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members or family members) homicides. However, this study provides characteristics and trends for youth homicide victims only and does not include adult homicide victim data. Incidents identified through the media scan were confirmed with accounts from local law enforcement or school officials familiar with the incident, and law enforcement reports were collected when possible. Incident characteristics (e.g., victim and perpetrator demographics, school affiliation, victim-perpetrator relationship, incident location, cause and manner of death, and firearm information) during July 1994–June 2016 were coded from law enforcement reports or interviews with law enforcement or school officials familiar with each incident. When interviews or law enforcement reports were not obtained, data were abstracted from articles published in the media only when a reliable source (i.e., a law enforcement or school official, or judicial proceedings regarding the incident) was cited. Finally, eight multiple-victim incidents from July 2016 to June 2018 were identified through Internet and online database searches; data for these incidents were abstracted from media articles citing a reliable source.[§] Overall, media reports were solely relied upon for coding demographic and circumstantial details for 80 (18.6%) of 431 incidents.

Victimization rates were calculated for school-aged youths involved in single- and multiple-victim incidents. Incidence rates (using the number of incidents as the numerator) were also calculated for multiple-victim incidents. Both rates used U.S. Department of Education and Current Population Survey[¶] data on students enrolled in U.S. public and private primary and secondary schools by year as the denominator. National Center for Health Statistics mortality data for July 1994–June 2016 (the most recent school year for which data from both the School-Associated Violent Death Surveillance System and National Center for Health Statistics are available) served as the denominator for estimating the proportion of all homicides among school-age youths that were school-associated (*3*). School-associated homicide trends

[§] 2016–17 and 2017–18 multiple-victim cases were identified through manual Internet searches using phrases such as "school shooting" and "multiple victims and school," as well as supplementary review of web-based firearm injury data sets (i.e., Everytown for Gun Safety and the Gun Violence Archive) to identify cases matching the School-Associated Violent Death Surveillance System case definition for multiple-victim youth homicides. Demographic and circumstance data for these cases were abstracted from media sources that referenced reliable sources as described above.

[¶] National Center for Education Statistics Common Core of Data, Public School Universe Survey, Private School Universe Survey, and State Nonfiscal Public Elementary/Secondary Education Survey were used to identify the number of students enrolled in U.S. public and private schools by race/ethnicity and school locale for rate calculation denominators. These calculations were limited to grades K–12. National Center for Education Statistics data were available only through the 2016–17 school year. Data from the 2017–18 school year are not yet available; thus, rate calculations for multiple-victim homicides (n = 93) are for the period from 1994–95 through 2016–17. U.S. Current Population Survey data on all students enrolled in U.S. schools by sex, school type, school level, and school year were used for denominators. Calculations using Current Population Survey data were limited to students aged 5–18 years and enrolled in grades K–12.

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were analyzed using Joinpoint regression based on Poisson distribution. For multiple-victim homicide victimization rates, to account for dependence between cases, the variance was estimated by applying a compound Poisson process based on data aggregated across 3-year intervals (*4*).

During July 1994–June 2016, 423 school-associated homicide incidents occurred, including 393 (92.9%) single-victim and 30 (7.1%) multiple-victim incidents (accounting for 90 youth homicides), representing 1.2% of all homicides among youths aged 5–18 years (39,208) in the United States during this period. Further, three multiple-victim incidents occurred during July 2016–June 2017, and five occurred during July 2017–June 2018, accounting for 31 additional youth homicides.

Single-victim homicide decedents were mostly males (77.4%) and aged 15–18 years (77.9%), whereas multiple-victim decedents were evenly distributed among females (50.4%) and males (49.6%), and nearly a quarter were aged 5–9 years (Table 1). The single-victim homicide rate was highest in urban (0.07 per 100,000), public (0.037), and high schools (0.091), and was 8.27 times higher for non-Hispanic black youths than for non-Hispanic white youths (Table 2). Among those with known motives, gang-related activity (58.2%) and interpersonal disputes (44%) were the most common motives for single-victim homicides. Retaliation (e.g., due to bullying, rivalry between peer groups, or receiving bad grades from a teacher) (39.0%) was the most common motive for multiple-victim homicides, followed by gang-related activity (34.1%) and interpersonal disputes (29.3%). When single-victim incident perpetrators were known, the most common relationships between perpetrator and victim were stranger (27.6%), rival gang member (23.8%), or schoolmate/fellow student (21.2%). Multiple-victim homicide perpetrators were primarily strangers (36.2%) or schoolmates (36.2%) of their victims. Ninety-four (23.9%) single- and five (13.2%) multiple-victim incidents involved more than one perpetrator.

Firearm injuries were the cause of death in 247 (62.8%) single-victim school-associated homicides and 35 (92.1%) multiple-victim incidents that resulted in 115 (95%) youth homicides (Supplementary Table, https://stacks.cdc.gov/view/cdc/61748). Among these, more than one firearm was used in 10 (4.0%) single-victim and five (14.3%) multiple-victim incidents. In addition, 40.0% of single-victim and 60.5% of multiple-victim homicide perpetrators who used firearms were aged <18 years.

Overall, the average rate of single-victim school-associated youth homicides during July 1994–June 2016 was 0.03 per 100,000 students, and the average rate of multiple-victim school-associated homicides during July 1994–June 2017 was 0.008 per 100,000 (Table 2). Single-victim homicide rates increased significantly from July 2000 to June 2007 after a decline since July 1994; however, the rate did not change significantly over the entire period ($p = 0.3$) (Figure 1). Multiple-victim homicide victimization rates fluctuated substantially annually, but did not indicate a significant trend for the overall period ($p = 0.6$) (Figure 2). However, multiple-victim homicide incidence rates declined during July 1994–June 2009 and then increased through June 2018. Incidence rates fluctuated substantially (range = 0–6 incidents per year), and the recent increase likely was related to eight incidents that occurred during July 2016–June 2018.

Discussion

Although school-associated youth homicides account for <2% of all youth homicides, they are devastating for families, schools, and entire communities; lessons learned from studying these incidents can have broad implications for youth violence prevention. Approximately 90% of school-associated homicide incidents during July 1994–June 2016 involved only one victim. The remaining incidents during this time frame involved multiple victims and accounted for a substantial number of decedents (90; 18.6% of all youth victims during this time). Single-victim school-associated homicide rates did not change significantly overall despite fluctuations over time. Conversely, multiple-victim school-associated homicide incidence decreased from July 1994 to June 2009, but then increased significantly through the 2017–18 school year. These results, highlighting the proportion of youth homicides that are school-associated and the fluctuation in annual trends, are consistent with previous research (*1*,*2*).

Single-victim school-associated homicide characteristics are consistent with national data indicating that racial/ethnic minority adolescents are at higher risk for being homicide victims than are non-Hispanic white youths, and that youth homicide rates are higher in urban areas (*5*,*6*). The frequent connections with gang activity and interpersonal disputes suggest that school-associated homicides might often be a reflection of broader community-wide risks (*7*). Firearm-related injuries were the cause of death for 70.4% of all youth school-associated homicides included in this study. Further, many perpetrators of firearm-involved incidents were aged <18 years. Research has shown that most firearms used by youths in school-associated violent death incidents were obtained from their own home or from a friend or relative, underscoring the need to ensure safe storage and to restrict minors' unsupervised access to firearms (*8*).

The findings in this report are subject to at least five limitations. First, only incidents reported in the media are included in this study, and changes in media coverage could affect trends. It is possible that some incidents could have been missed; however,

TABLE 1. School-associated youth homicide victim and perpetrator characteristics in single- (1994–2016) and multiple-victim (1994–2018) homicide incidents — United States, 1994–2018

	July 1994–June 2016		July 1994–June 2018	
	Victims involved in single-victim incidents	Perpetrators involved in single-victim homicide incidents	Victims involved in multiple-victim homicide incidents*	Perpetrators involved in multiple-victim homicide incidents*
Characteristic	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**
Total no. of victims or perpetrators	**393**	**562**	**121**	**47**
Sex				
Male	304 (77.4)	452 (80.4)	60 (49.6)	46 (97.9)
Female	89 (22.6)	30 (5.3)	61 (50.4)	0 (—)
Unknown	0 (—)	80 (14.2)	0 (—)	1 (2.1)
Race/Ethnicity				
Black, non-Hispanic	208 (52.9)	218 (38.8)	15 (12.4)	11 (23.4)
White, non-Hispanic	92 (23.4)	68 (12.1)	84 (69.4)	22 (46.8)
Hispanic	38 (9.7)	89 (15.8)	8 (6.6)	8 (17.0)
Asian/Pacific Islander	10 (2.5)	22 (3.9)	4 (3.3)	0 (—)
American Indian/Alaska Native	1 (0.3)	2 (0.4)	7 (5.8)	2 (4.3)
Other	5 (1.3)	8 (1.4)	3 (2.5)	2 (4.3)
Unknown	39 (9.9)	155 (27.6)	0 (—)	2 (4.3)
Age group (yrs)				
5–9	12 (3.1)	1 (0.2)	28 (23.1)	0 (—)
10–14	75 (19.1)	37 (6.6)	28 (23.1)	6 (12.8)
15–18	306 (77.9)	277 (49.3)	65 (53.7)	23 (48.9)
19–24	0 (—)	101 (18.0)	0 (—)	9 (19.1)
≥25	0 (—)	20 (3.6)	0 (—)	8 (17.0)
Unknown	0 (—)	126 (22.4)	0 (—)	1 (2.1)
Cause of death				
Firearm	247 (62.8)	360 (64.1)	115 (95.0)	43 (91.5)
Stabbing	93 (23.7)	125 (22.2)	2 (1.7)	2 (4.3)
Blunt force	32 (8.1)	46 (8.2)	4 (3.3)	2 (4.3)
Asphyxiation	12 (3.1)	14 (2.5)	0 (—)	0 (—)
Other	8 (2.0)	16 (2.8)	0 (—)	0 (—)
Unknown	1 (0.3)	1 (0.2)	0 (—)	0 (—)
Location of incident				
On way to/from campus or school-sponsored event	200 (50.9)	304 (54.1)	10 (8.3)	7 (14.9)
On campus	186 (47.3)	246 (43.8)	111 (91.7)	40 (85.1)
At school-sponsored event	7 (1.8)	12 (2.1)	0 (—)	0 (—)
Location of off-campus incident				
Sidewalk/Path	91 (45.5)	147 (26.2)	5 (4.1)	3 (6.4)
Street	26 (13.0)	36 (6.4)	2 (1.7)	2 (4.3)
Parking lot	16 (8.0)	26 (4.6)	0 (—)	0 (—)
Bus stop	21 (10.5)	24 (4.3)	0 (—)	0 (—)
Motor vehicle	11 (5.5)	23 (4.1)	0 (—)	0 (—)
Athletic event/Field	6 (3.0)	10 (1.8)	0 (—)	0 (—)
On bus (school or public bus)	5 (2.5)	8 (1.4)	1 (0.8)	1 (2.1)
Playground/Park	3 (1.5)	5 (0.9)	0 (—)	0 (—)
Other	21 (10.5	25 (4.4)	2 (1.7)	1 (2.1)
Location of on-campus incident				
Parking lot	36 (19.4)	53 (9.4)	3 (2.5)	3 (6.4)
Campus lawn	25 (13.4)	37 (6.6)	5 (4.1)	2 (4.3)
Hallway	21 (11.3)	30 (5.3)	24 (19.8)	6 (12.8)
Athletic field/Court/Gymnasium	21 (11.3)	29 (5.2)	2 (1.7)	2 (4.3)
Sidewalk	16 (8.6)	19 (3.4)	1 (0.8)	0 (—)
School entrance	15 (8.1)	19 (3.4)	3 (2.5)	1 (2.1)
Bathroom	11 (5.9)	16 (2.8)	2 (1.7)	1 (2.1)
Playground	9 (4.8)	11 (2.0)	2 (1.7)	1 (2.1)
Cafeteria	7 (3.8)	7 (1.2)	10 (8.3)	4 (8.5)
Classroom/Library	7 (3.8)	7 (1.2)	51 (42.1)	10 (21.3)
Behind school building	3 (1.6)	4 (0.7)	3 (2.5)	7 (14.9)
Bus stop	3 (1.6)	3 (0.5)	0 (—)	0 (—)
Other	12 (6.5)	11 (2.0)	5 (4.1)	3 (6.4)

See table footnotes on the next page.

TABLE 1. (*Continued*) School-associated youth homicide victim and perpetrator characteristics in single- (1994–2016) and multiple-victim (1994–2018) homicide incidents — United States. 1994–2018

	July 1994–June 2016		July 1994–June 2018	
	Victims involved in single-victim incidents	Perpetrators involved in single-victim homicide incidents	Victims involved in multiple-victim homicide incidents*	Perpetrators involved in multiple-victim homicide incidents*
Characteristic	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**
School affiliation†				
Student	361 (91.9)	250 (44.5)	112 (92.6)	18 (38.3)
No affiliation/Community resident	22 (5.6)	211 (37.5)	6 (5.0)	15 (31.9)
Student at another school	0 (—)	35 (6.2)	2 (1.7)	2 (4.3)
Former student	2 (0.5)	12 (2.1)	0 (—)	5 (10.6)
Student's parent/Guardian	0 (—)	5 (0.9)	0 (—)	2 (4.3)
Other relative of student	0 (—)	3 (0.5)	0 (—)	1 (2.1)
Faculty/Staff member	0 (—)	1 (0.2)	0 (—)	0 (—)
Other	0 (—)	0 (—)	0 (—)	1 (2.1)
Unknown	8 (2.0)	45 (8.0)	1 (0.8)	3 (6.4)
Homicide-suicide	**10 (2.5)**	**10 (1.8)**	**51 (42.1)**	**10 (21.3)**
Relationship of perpetrator to victim†				
Stranger	N/A	155 (27.6)	N/A	17 (36.2)
Rival gang member	N/A	134 (23.8)	N/A	1 (2.1)
Schoolmate/Fellow student	N/A	119 (21.2)	N/A	17 (36.2)
Residents of same community	N/A	47 (8.4)	N/A	3 (6.4)
Friend/Acquaintance	N/A	23 (4.1)	N/A	1 (2.1)
Dating partner	N/A	18 (3.2)	N/A	4 (8.5)
Relative	N/A	5 (0.9)	N/A	2 (4.3)
Faculty/Staff member	N/A	1 (0.2)	N/A	0 (—)
Unknown	N/A	60 (10.7)	N/A	2 (4.3)
Motive§,¶				
Gang-related activity	N/A	238 (58.2)	N/A	14 (34.1)
Interpersonal dispute	N/A	180 (44.0)	N/A	12 (29.3)
Brawl/Street fight	N/A	98 (24.0)	N/A	4 (9.8)
Retaliation	N/A	84 (20.5)	N/A	16 (39.0)
Dating partner problem/Lover's triangle	N/A	39 (9.5)	N/A	8 (19.5)
Sexual violence	N/A	20 (4.9)	N/A	8 (19.5)
Robbery	N/A	32 (7.8)	N/A	9 (22.0)
General characteristics¶,**				
Member of a gang	N/A	237 (56.3)	N/A	16 (38.1)
History of arrest	N/A	164 (39.0)	N/A	18 (42.9)
Regularly used alcohol/drugs	N/A	72 (17.1)	N/A	7 (16.7)
Intoxicated at time of incident	N/A	37 (8.8)	N/A	8 (19.0)
Mental health condition				
Diagnosed	N/A	12 (2.9)	N/A	7 (16.7)
Suspected	N/A	8 (1.9)	N/A	7 (16.7)

Abbreviation: N/A = not applicable.

* Among 38 incidents.

† School affiliation and victim-perpetrator relationship categories are mutually exclusive.

§ Information on motive was available for 409 (72.8%) single-victim and 41 (87.2%) multiple-victim homicide perpetrators. Percentages are based on the number of perpetrators with known motives.

¶ Motives and general characteristics are not mutually exclusive.

** General characteristics data were available for 421 (74.9%) single-victim and 42 (89.4%) multiple-victim homicide perpetrators. Percentages are based on the number of perpetrators with known characteristics.

incident data were compared with other online data sources (e.g., Gun Violence Archive [https://www.gunviolencearchive.org/]) containing information on school-associated homicides to ensure that the surveillance system captured cases described elsewhere if they met inclusion criteria. Second, circumstantial data collected through interviews were susceptible to recall bias, given that interviews were conducted after incidents occurred. Third, only multiple-victim incidents were included in analyses for the 2 most recent school years. Therefore, the single-victim trend analysis ended in June 2016. It is unlikely that multiple-victim incidents would be omitted in the case identification process for the 2 most recent school years, given the extensive media coverage that such incidents garner. Fourth, while only media reports citing reliable sources were used when law enforcement reports were unavailable, the information in these reports might be subject to reporting biases and might not be comprehensive in nature. Finally, statistical power for some comparisons was limited because of small numbers.

TABLE 2. School-associated single- (1994–2016) and multiple-victim (1994–2017) homicide rates* among youths aged 5–18 years, by sex, race/ethnicity, and selected incident and school characteristics — United States, 1994–2017

	July 1994–June 2016			July 1994–June 2017†			
	Single-victim homicide incidents (n = 393)			Multiple-victim homicide incidents (n = 33)			
Characteristic	No. of youth deaths	Rate*	Rate ratio (95% CI)	No. of youth deaths	Rate*	Rate ratio (95% CI)	No. of incidents§
All students	**393**	**0.0344**	—	**93**	**0.0078**	—	**33**
Sex¶							
Female**	89	0.0176	—	47	0.0089	—	17
Male	304	0.0522	2.96 (2.34–3.75)	46	0.0076	0.85 (0.51–1.43)	21
Race/Ethnicity††							
White, non-Hispanic**	92	0.0144	—	62	0.0094	—	15
American Indian/Alaska Native	1	0.0081	0.56 (0.08–4.04)	7	0.0545	5.83 (1.10–30.89)	2
Asian	10	0.0199	1.38 (0.72–2.64)	1	0.0019	0.2 (0.05–0.85)	1
Black, non-Hispanic	208	0.1195	8.27 (6.47–10.57)	13	0.0071	0.76 (0.31–1.91)	11
Hispanic	38	0.0175	1.21 (0.83–1.77)	7	0.0030	0.33 (0.11–0.93)	5
Other/Unknown§§	44	—	—	3	—	—	6
Fatal firearm injury							
No**	145	0.0127	—	6	0.0005	—	3
Yes	247	0.0216	1.7 (1.39–2.09)	87	0.0073	14.5 (4.04–52.03)	30
Unknown§§	1	—	—	0	—	—	0
School locale††							
Rural**	61	0.0177	—	22	0.0061	—	9
Suburban	98	0.0239	1.35 (0.98–1.86)	54	0.0125	2.05 (0.61–6.90)	10
Urban	234	0.0702	3.97 (2.99–5.26)	17	0.0049	0.8 (0.31–2.07)	14
School type¶							
Private**	11	0.0103	—	5	0.0045	—	1
Public	380	0.0369	3.57 (1.96–6.50)	88	0.0082	1.81 (0.23–13.94)	32
Unknown§§	2	—	—	0	—	—	0
School level¶							
Elementary/Middle**	108	0.0136	—	41	0.0049	—	14
High/Combination	285	0.0908	6.67 (5.34–8.32)	52	0.0157	3.18 (0.99–10.19)	19

Abbreviation: CI = confidence interval.

* Per 100,000 students enrolled in U.S. public and private primary and secondary schools.

† National Center for Education Statistics data were available only through the 2016–17 school year. Data from the 2017–18 school year are not yet available; thus, rate calculations for multiple-victim homicides (n = 93) are for the period from 1994–95 through 2016–17.

§ Number of incidents for sex and race/ethnicity categories do not sum to 33 because incidents involved several possible combinations of these variables (e.g., one incident could involve only males, only females, or a combination of both males and females).

¶ U.S. Current Population Survey data on all students enrolled in U.S. schools by sex, school type, and school level were used for denominators. Calculations using Current Population Survey data were limited to students who were aged 5–18 years and enrolled in grades K–12.

** Referent category.

†† National Center for Education Statistics Common Core of Data, Public School Universe Survey, Private School Universe Survey, and State Nonfiscal Public Elementary/Secondary Education Survey were used to identify the number of students enrolled in U.S. public and private schools by race/ethnicity and school locale for rate calculation denominators. These calculations were limited to grades K–12.

§§ Rate and rate ratio were not calculated for "Unknown."

The number of school-associated youth homicides remains unacceptably high. The findings indicating that the characteristics of many school-associated homicides resemble youth homicides in the broader community suggest the need for prevention beyond the school setting. CDC's *A Comprehensive Technical Package for the Prevention of Youth Violence and Associated Risk Behaviors* can help states, communities, and schools implement approaches based on the best available evidence (*9*). For example, communities experiencing gang and firearm violence might benefit from street outreach programs (e.g., Cure Violence, Safe Streets) that train persons with credibility in the community (e.g., former gang members) to change community norms and reduce escalating conflicts. CDC's technical package describes a range of prevention options, including strategies that promote connections between youths and caring adults, enhance youths' problem-solving and coping skills, and reduce risk among youths who have been violent. A comprehensive approach could address risk for youth violence on and off school property.

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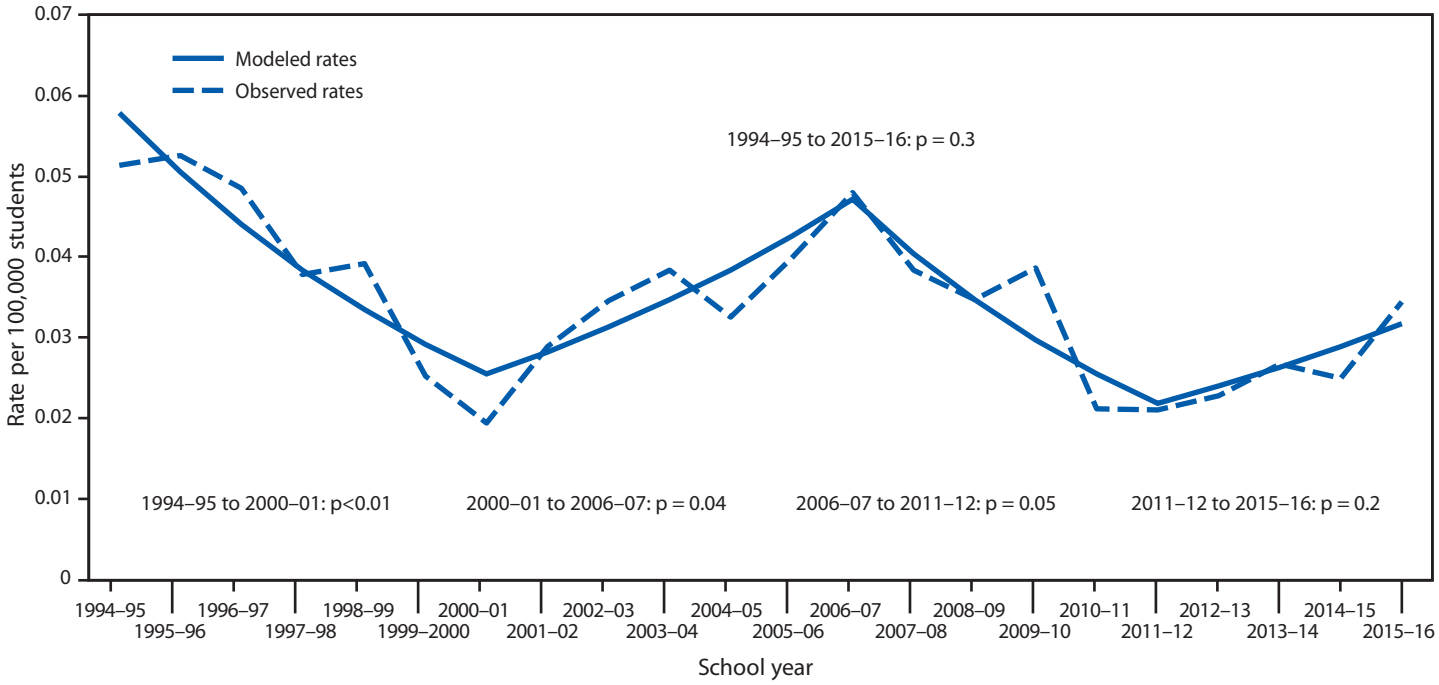
FIGURE 1. Victimization rates* for school-associated single-victim youth homicides per 100,000 students — United States, July 1994–June 2016



* Victimization rates were calculated with number of school-aged youth victims (i.e., aged 5–18 years) as numerators and number of students enrolled in U.S. primary and secondary public and private schools as denominators. For single-victim school-associated homicides, incidence rates are equivalent to victimization rates. Single-victim homicide trends were analyzed using Joinpoint regression based on Poisson distribution, and the predicted rates from the model are shown as modeled rates.

Summary

What is already known about this topic?

Patterns in single- and multiple-victim school-associated homicide rates differ, and both fluctuate annually.

What is added by this report?

Single-victim homicide rates remained stable overall during 1994–2016. School-associated single-victim homicides share characteristics with youth homicides in the community, often involving racial/ethnic minorities, males aged 15–18 years, and occurring in urban areas. Firearm-related injuries were the cause of death in 247 (62.8%) and 115 (95%) single- and multiple-victim homicides, respectively. Multiple-victim incidence rates increased significantly from July 2009 to June 2018.

What are the implications for public health practice?

Evidence-based youth violence prevention options exist, including strategies that promote connections between youths and caring adults, enhance problem-solving and coping skills, and reduce risk among youths who have been violent. A comprehensive violence prevention approach is important for reducing violence on and off school grounds.

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All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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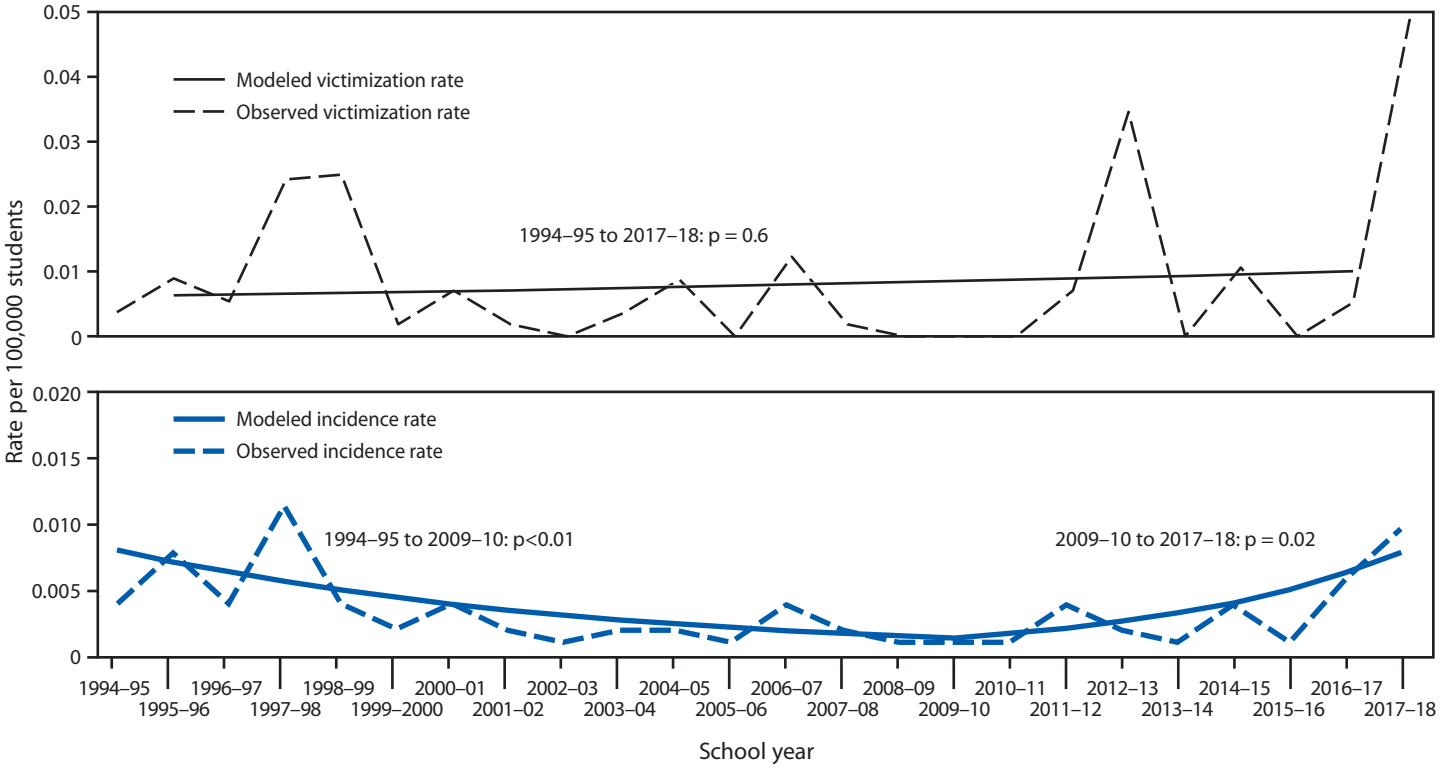
FIGURE 2. Victimization* and incidence rates† of school-associated multiple-victim homicide per 100,000 students — United States, July 1994–June 2018§



* Victimization rates were calculated as number of school-aged youth victims (i.e., aged 5–18 years) as the numerator and number of students enrolled in U.S. primary and secondary public and private schools as the denominator.

† Incidence rates were calculated as number of school-associated youth homicide incidents as the numerator and number of students enrolled in U.S. primary and secondary public and private schools as the denominator.

§ School-associated homicide trends were analyzed using Joinpoint regression based on Poisson distribution. For victimization rates, to account for dependence between multiple-victim incidents, the variance was estimated by applying a compound Poisson process based on data aggregated across 3-year intervals. The predicted rates from the model are shown as modeled rates.

Characteristics of Deceased Solid Organ Donors and Screening Results for Hepatitis B, C, and Human Immunodeficiency Viruses — United States, 2010–2017

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The ongoing U.S. opioid crisis has resulted in an increase in drug overdose deaths and acute hepatitis C virus (HCV) infections, with young persons (who might be eligible organ donors) most affected.*,† In 2013, the Public Health Service released a revised guideline to reduce the risk for unintended organ transplantation–associated hepatitis B virus (HBV), HCV, and human immunodeficiency virus (HIV) transmission (*1*). The guideline describes criteria to categorize donors at increased risk (increased risk donors [IRDs]) for transmitting these viruses to recipients (*1*). It also recommends universal donor testing for HBV, HCV, and HIV.§ CDC analyzed deceased donor data for the period 2010–2017 reported to the Organ Procurement and Transplantation Network for IRDs and standard risk donors (SRDs) (i.e., donors who do not meet any of the criteria for increased risk designation). During this period, the proportion of IRDs increased approximately 200%, from 8.9% to 26.3%; the percentage with drug intoxication reported as the mechanism of death also increased approximately 200%, from 4.3% to 13.4%; and the proportion of these donors with reported injection drug use (IDU) increased approximately 500%, from 1.3% to 8.0%. Compared with SRDs, IRDs were significantly more likely to have positive HBV and HCV screening results. These findings demonstrate the continuing need for identifying viral bloodborne pathogen infection risk factors among deceased donors to reduce the risk for transmission, monitor posttransplant infection in recipients, and offer treatment if infection occurs.

In the United States, all organ procurement organizations and transplant centers participate in the Organ Procurement and Transplantation Network, which is operated by the United Network for Organ Sharing through a contract with the Health Resources and Services Administration (HRSA). Participating facilities report donor data to the United Network for Organ Sharing, including donor risk type (i.e., increased or standard risk), age, sex, race, mechanism of death (further stratified by drug intoxication and history of IDU), and HBV, HCV, and HIV screening results.¶ Data for all deceased solid organ donors with one or more organs recovered for the purpose of transplantation during January 1, 2010–December 31, 2017 were analyzed.

Descriptive statistics and frequencies were calculated by year to assess trends in demographic characteristics and HBV, HCV, and HIV screening results among all donors and by donor risk type. The change in the proportions of IRDs, SRDs, drug intoxication reported as mechanism of death, and IDU history from 2010 to 2017 along with comparisons of HBV and HCV screening results between IRDs and SRDs were assessed using the chi-squared test, with p-values <0.05 considered statistically significant. Anti-HCV and anti-HIV screening results for the period 2010–2017, and nucleic acid test (NAT) results for the period 2014–2017 were used because implementation of the guideline recommendation for HCV and HIV testing by NAT did not begin until 2014.** Statistical software was used to conduct all analyses.

Deceased Donors

The annual number of deceased donors increased 29.5%, from 7,943 in 2010 to 10,287 in 2017 (Table 1). Among the 70,414 deceased donors during this period, 57,782 (82.1%), 12,592 (17.9%), and 40 (<0.1%) were classified as SRDs, IRDs, and unknown risk, respectively. The mean donor age was 39.9 years, 59.6% were male, and 66.2% were white. The number of deceased donors with drug intoxication reported as the mechanism of death increased from 342 (4.3%) in 2010 to 1,382 (13.4%) in 2017 (p<0.001). Among those with drug intoxication as mechanism of death, the number with IDU history increased from 107 (1.3%) in 2010 to 825 (8.0%) in 2017 (p<0.001). From 2010 to 2017, hepatitis B surface antigen (HBsAg) positivity remained constant (0.1%), total hepatitis B core antibody (anti-HBc) positivity (indicating

* https://www.cdc.gov/nchs/data/databriefs/db294.pdf.

† https://www.cdc.gov/hepatitis/statistics/2016surveillance/pdfs/2016HepSurveillanceRpt.pdf.

§ HBV surface antigen and core antibody, anti-HCV antibody, HCV NAT, and anti-HIV antibody testing are required for all donors; combined HIV antigen/antibody or HIV NAT are additionally required for IRDs. HBV NAT is not required for SRDs or IRDs.

¶ HBV: HBsAg, anti-HBc, and NAT; HCV: anti-HCV and NAT; HIV: anti-HIV, Ag/Ab and/or NAT.

** https://optn.transplant.hrsa.gov/resources/guidance/phs-guideline-for-reducing-human-immunodeficiency-virus-hiv-hepatitis-b-virus-hbv-and-hepatitis-c-virus-hcv-through-organ-transplantation-frequently-asked-questions-2013/.

TABLE 1. Characteristics of deceased organ donors (N = 70,414) — Organ Procurement and Transplantation Network, United States, 2010–2017

Characteristic	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	2016 No. (%)	2017 No. (%)	Total 2010–2017 No. (%)
Total	**7,943**	**8,126**	**8,143**	**8,269**	**8,596**	**9,079**	**9,971**	**10,287**	**70,414 (100)**
Risk type for deceased donor*									
Standard risk	7,226 (91.0)	7,283 (89.6)	7,171 (88.1)	7,157 (86.6)	6,815 (79.3)	7,059 (77.8)	7,491 (75.1)	7,580 (73.7)	**57,782 (82.1)**
Increased risk	709 (8.9)	836 (10.3)	966 (11.9)	1,111 (13.4)	1,772 (20.6)	2,016 (22.2)	2,478 (24.9)	2,704 (26.3)	**12,592 (17.9)**
Mean age (yrs), (SD)	40.5 (18.2)	40.1 (18.1)	39.8 (18.0)	40.1 (18.0)	40.1 (17.6)	39.5 (17.9)	39.5 (17.3)	40.0 (17.1)	**39.9 (17.8)**
Age group (yrs)									
0–17	841 (10.6)	881 (10.8)	852 (10.5)	873 (10.6)	841 (9.8)	939 (10.3)	934 (9.4)	896 (8.7)	**7,057 (10.0)**
18–24	1,053 (13.3)	1,060 (13.0)	1,095 (13.5)	1,041 (12.6)	1,079 (12.6)	1,218 (13.4)	1,220 (12.2)	1,210 (11.8)	**8,976 (12.8)**
25–34	1,116 (14.1)	1,181 (14.5)	1,240 (15.2)	1,278 (15.5)	1,395 (16.2)	1,490 (16.4)	1,885 (18.9)	1,962 (19.1)	**11,547 (16.4)**
35–44	1,196 (15.1)	1,247 (15.4)	1,209 (14.9)	1,335 (16.1)	1,380 (16.1)	1,473 (16.2)	1,708 (17.1)	1,766 (17.2)	**11,314 (16.0)**
45–54	1,770 (22.3)	1,808 (22.3)	1,870 (23.0)	1,782 (21.6)	1,888 (22.0)	1,869 (20.6)	2,006 (20.1)	2,063 (20.0)	**15,056 (21.4)**
55–64	1,298 (16.3)	1,354 (16.7)	1,303 (16.0)	1,326 (16.0)	1,399 (16.3)	1,472 (16.2)	1,590 (16.0)	1,724 (16.8)	**11,466 (16.3)**
≥65	669 (8.4)	595 (7.3)	574 (7.1)	634 (7.7)	614 (7.1)	618 (6.8)	628 (6.3)	666 (6.4)	**4,998 (7.1)**
Sex									
Male	4,683 (59.0)	4,764 (58.6)	4,820 (59.2)	4,906 (59.3)	5,164 (60.1)	5,486 (60.4)	5,957 (59.7)	6,200 (60.3)	**41,980 (59.6)**
Female	3,260 (41.0)	3,362 (41.4)	3,323 (40.8)	3,363 (40.7)	3,432 (39.9)	3,593 (39.6)	4,014 (40.3)	4,087 (39.7)	**28,434 (40.4)**
Race									
White	5,284 (66.5)	5,397 (66.4)	5,382 (66.1)	5,461 (66.0)	5,709 (66.4)	5,966 (65.7)	6,647 (66.7)	6,790 (66.0)	**46,636 (66.2)**
Black	1,323 (16.6)	1,296 (16.0)	1,369 (16.8)	1,371 (16.6)	1,341 (15.6)	1,476 (16.3)	1,569 (15.7)	1,603 (15.6)	**11,348 (16.1)**
Hispanic	1,029 (13.0)	1,078 (13.2)	1,033 (12.7)	1,111 (13.5)	1,144 (13.3)	1,236 (13.6)	1,310 (13.1)	1,434 (13.9)	**9,375 (13.3)**
Other†	307 (3.9)	355 (4.4)	359 (4.4)	326 (3.9)	402 (4.7)	401 (4.4)	445 (4.5)	460 (4.5)	**3,055 (4.4)**
Mechanism of death									
Drug intoxication	342 (4.3)	473 (5.8)	440 (5.4)	560 (6.8)	625 (7.3)	848 (9.3)	1,262 (12.7)	1,382 (13.4)	**5,932 (8.4)**
Injection drug use§	107 (1.3)	169 (2.1)	178 (2.2)	248 (3.0)	332 (3.9)	471 (5.2)	727 (7.3)	825 (8.0)	**3,057 (4.3)**
Hepatitis B surface antigen									
Positive	7 (0.1)	6 (0.1)	6 (0.1)	7 (0.1)	7 (0.1)	8 (0.1)	9 (0.1)	11 (0.1)	**61 (0.1)**
Negative	7,934 (99.9)	8,120 (99.9)	8,137 (99.9)	8,261 (99.9)	8,588 (99.9)	9,071 (99.9)	9,962 (99.9)	10,276 (99.9)	**70,349 (99.9)**
Hepatitis B core antibody									
Positive	398 (5.0)	369 (4.5)	400 (4.9)	382 (4.6)	419 (4.9)	440 (4.9)	498 (5.0)	484 (4.7)	**3,390 (4.8)**
Negative	7,541 (95.0)	7,755 (95.5)	7,741 (95.1)	7,883 (95.4)	8,176 (95.1)	8,639 (95.1)	9,473 (95.0)	9,803 (95.3)	**67,011 (95.2)**
HCV antibody									
Positive	331 (4.2)	320 (3.9)	335 (4.1)	361 (4.4)	436 (5.1)	535 (5.9)	661 (6.6)	746 (7.3)	**3,725 (5.3)**
Negative	7,609 (95.2)	7,806 (96.1)	7,806 (95.9)	7,908 (95.6)	8,160 (94.1)	8,544 (94.1)	9,309 (93.4)	9,541 (92.7)	**66,683 (94.7)**
HCV RNA by NAT									
Positive	—	—	—	—	12 (3.9)	330 (4.2)	461 (4.6)	503 (4.9)	**1,306 (4.6)**
Negative	—	—	—	—	298 (96.1)	7,482 (95.8)	9,509 (95.4)	9,783 (95.1)	**27,072 (95.4)**
HIV antibody¶									
Positive	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	2 (0.0)	7 (0.1)	13 (0.1)	**23 (0.0)**
Negative	7,936 (100.0)	8,123 (100.0)	8,140 (100.0)	8,265 (100.0)	8,539 (100.0)	8,821 (100.0)	9,742 (99.9)	10,206 (99.9)	**69,772 (100.0)**

Abbreviations: HCV = hepatitis C virus; HIV = human immunodeficiency virus; NAT = nucleic acid test; SD = standard deviation.
* 40 deceased donors were categorized with unknown risk type.
† Includes Asian, America Indian/Alaska Native, Native Hawaiian, and multiracial.
§ Among those with drug intoxication reported as a mechanism of death and a reported history of injection drug use.
¶ The HIV Organ Policy Equity Act (HOPE Act) of 2013 allows transplantation, under research protocols, of organs from donors infected with HIV into recipients who are also infected with HIV. https://optn.transplant.hrsa.gov/governance/public-comment/changes-to-hope-act-open-variance/.

previous or ongoing HBV infection) decreased slightly (from 5.0% to 4.7%), anti-HCV positivity increased (4.2% to 7.3%), and anti-HIV positivity increased slightly (0.0% to 0.1%). From 2014 to 2017, HCV RNA positivity increased (3.9% to 4.9%).

Increased Risk Donors

The number and percentage of IRDs among all deceased donors increased from 709 (8.9%) in 2010 to 2,704 (26.3%) in 2017 (Table 2) (p<0.001). Among IRDs, mean age was 35.2 years, 66.3% were male, and 70.0% were white. From 2010 to 2017, there were no substantial changes in HBsAg or anti-HBc positivity; however, anti-HCV positivity increased (15.9% to 21.6%). From 2014 to 2017, HCV RNA positivity also increased (8.6% to 15.7%).

From 2014 to 2017, the percentage of IRDs tested by HCV and HIV NAT increased from 4.6% to >99.9% and from 4.5% to 99.9%, respectively. During this period, 55 (one in

TABLE 2. Characteristics of deceased increased risk donors (IRDs) (N = 12,592) — Organ Procurement and Transplantation Network, United States, 2010–2017

Characteristic	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	2016 No. (%)	2017 No. (%)	Total 2010–2017 No. (%)
IRDs (% among all deceased donors)	**709 (8.9)**	**836 (10.3)**	**966 (11.9)**	**1,111 (13.4)**	**1,772 (20.6)**	**2,016 (22.2)**	**2,478 (24.9)**	**2,704 (26.3)**	**12,592 (17.9)**
Mean age (yrs), (SD)	34.8 (14.3)	34.5 (14.1)	34.0 (14.5)	34.3 (14.1)	35.5 (14.1)	35.2 (13.7)	35.4 (13.2)	35.9 (13.1)	**35.2 (13.7)**
Age group (yrs)									
0–17	45 (6.4)	37 (4.4)	71 (7.4)	72 (6.5)	96 (5.4)	98 (4.7)	93 (3.8)	103 (3.8)	**615 (4.8)**
18–24	150 (21.2)	195 (23.3)	200 (20.7)	228 (20.5)	337 (19.0)	382 (19.0)	405 (16.3)	394 (14.6)	**2,291 (18.2)**
25–34	187 (26.4)	241 (28.8)	284 (29.4)	307 (27.6)	504 (28.4)	610 (30.3)	840 (33.9)	899 (33.3)	**3,872 (30.8)**
35–44	127 (17.9)	146 (17.5)	159 (16.5)	230 (20.7)	337 (19.0)	411 (20.4)	520 (21.0)	618 (22.8)	**2,548 (20.2)**
45–54	130 (18.3)	133 (15.9)	166 (17.2)	174 (15.7)	302 (17.0)	311 (15.4)	387 (15.6)	411 (15.2)	**2,014 (16.0)**
55–64	54 (7.6)	69 (8.3)	65 (6.7)	83 (7.5)	155 (8.8)	158 (7.8)	181 (7.3)	223 (8.2)	**988 (7.9)**
≥65	16 (2.3)	15 (1.8)	21 (2.2)	17 (1.5)	41 (2.3)	46 (2.3)	52 (2.1)	56 (2.1)	**264 (2.1)**
Sex									
Male	476 (67.1)	552 (66.0)	642 (66.5)	737 (66.3)	1,184 (66.8)	1,360 (67.5)	1,637 (66.1)	1,760 (65.1)	**8,348 (66.3)**
Female	233 (32.9)	284 (34.0)	324 (33.5)	374 (33.7)	588 (33.2)	656 (32.5)	841 (33.9)	944 (34.9)	**4,244 (33.7)**
Race									
White	529 (74.6)	617 (73.8)	728 (75.4)	804 (72.4)	1,191 (67.2)	1,366 (67.8)	1,734 (70.0)	1,849 (68.4)	**8,818 (70.0)**
Black	101 (14.2)	107 (12.8)	131 (13.6)	152 (13.7)	296 (16.7)	334 (16.6)	363 (14.7)	431 (15.9)	**1,915 (15.2)**
Hispanic	68 (9.6)	101 (12.1)	88 (9.1)	137 (12.3)	222 (12.5)	252 (12.5)	302 (12.2)	335 (12.4)	**1,505 (12.0)**
Other*	11 (1.6)	11 (1.3)	19 (1.9)	18 (1.6)	63 (3.6)	64 (3.1)	79 (3.1)	89 (3.3)	**354 (2.8)**
Hepatitis B surface antigen									
Positive	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.1)	5 (0.3)	4 (0.2)	3 (0.1)	**14 (0.1)**
Negative	709 (100.0)	836 (100.0)	966 (100.0)	1,111 (100.0)	1,770 (99.9)	2,011 (99.7)	2,474 (99.8)	2,701 (99.9)	**12,578 (99.9)**
Hepatitis B core antibody									
Positive	57 (8.0)	51 (6.1)	77 (8.0)	79 (7.1)	134 (7.6)	126 (6.3)	173 (7.0)	189 (7.0)	**886 (7.0)**
Negative	652 (92.0)	784 (93.9)	889 (92.0)	1,032 (92.9)	1,638 (92.4)	1,890 (93.7)	2,305 (93.0)	2,515 (93.0)	**11,705 (93.0)**
HCV antibody									
Positive	113 (15.9)	137 (16.4)	154 (15.9)	201 (18.1)	313 (17.7)	390 (19.4)	509 (20.5)	583 (21.6)	**2,400 (19.1)**
Negative	596 (84.1)	699 (83.6)	812 (84.1)	910 (81.9)	1,459 (82.3)	1,626 (80.7)	1,969 (79.5)	2,121 (78.4)	**10,192 (80.9)**
HCV RNA by NAT									
Positive	—	—	—	—	7 (8.6)†	252 (14.5)§	363 (14.7)¶	423 (15.7)**	**1,045 (14.9)**
Negative	—	—	—	—	74 (91.4)	1,488 (85.5)	2,114 (85.3)	2,280 (84.3)	**5,956 (85.1)**
Percentage of IRDs tested for HCV RNA by NAT	—	—	—	—	81 (4.6)	1,740 (86.3)	2,477 (>99.9)	2,703 (>99.9)	**7,001 (78.1)**
HIV antibody††									
Positive	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.1)	7 (0.3)	**10 (0.1)**
Negative	708 (100.0)	836 (100.0)	966 (100.0)	1,111 (100.0)	1,762 (100.0)	1,969 (100.0)	2,410 (99.9)	2,667 (99.7)	**12,429 (99.9)**
HIV RNA by NAT									
Positive	—	—	—	—	0 (0.0)	0 (0.0)	2 (0.1)	4 (0.2)	**6 (0.1)§§**
Negative	—	—	—	—	79 (100.0)	1,733 (100.0)	2,468 (99.9)	2,698 (99.8)	**6,978 (99.9)**
Percentage of IRDs tested for HIV RNA by NAT	—	—	—	—	79 (4.5)	1,733 (86.0)	2,470 (99.7)	2,702 (99.9)	**6,984 (77.9)**
HIV p24 antigen									
Positive	—	—	—	—	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	**0 (0.0)**
Negative	—	—	—	—	2 (100.0)	59 (100.0)	78 (100.0)	36 (100.0)	**175 (100.0)**
HBV DNA by NAT									
Positive	—	—	—	—	0 (0.0)	8 (0.5)	9 (0.4)	9 (0.3)	**26 (0.4)**
Negative	—	—	—	—	81 (100.0)	1,732 (99.5)	2,467 (99.6)	2,694 (99.7)	**6,974 (99.6)**
Percentage of IRDs tested for HBV DNA by NAT	—	—	—	—	81 (4.6)	1,740 (86.3)	2,467 (99.6)	2,703 (>99.9)	**6,991 (77.9)**

Abbreviations: HBV = hepatitis B virus; HCV = hepatitis C virus; HIV = human immunodeficiency virus; NAT = nucleic acid test; SD = standard deviation.

* Includes Asian, America Indian/Alaska Native, Native Hawaiian, and multiracial.

† Six of the seven HCV RNA–positive donors were anti-HCV positive; one was negative.

§ 243 of 252 (96.4%) HCV RNA–positive donors were anti-HCV positive; nine (3.6%)were negative.

¶ 344 of 363 (94.8%) HCV RNA–positive donors were anti-HCV positive; 19 (5.2%) were negative.

** 397 of 423 (93.9%) HCV RNA–positive donors were anti-HCV positive; 26 (6.1%) were negative.

†† The HIV Organ Policy Equity Act (HOPE Act) of 2013 allows transplantation, under research protocols, of organs from donors infected with HIV into recipients who are also infected with HIV. https://optn.transplant.hrsa.gov/governance/public-comment/changes-to-hope-act-open-variance/.

§§ Five of the six HIV RNA-positive donors were anti-HIV positive; one (16.7%) was negative.

2014; nine in 2015; 19 in 2016; and 26 in 2017) or 5.3% of all HCV RNA–positive IRDs were anti-HCV negative (i.e., acute infection before antibody response). From 2014 to 2017, the percentage of IRDs tested by HBV NAT increased from 4.6% to >99.9%.

Standard Risk Donors

Whereas the number of deceased SRDs rose from 7,226 in 2010 to 7,580 in 2017, the percentage of SRDs among all deceased donors decreased from 90.1% to 73.7% (Table 3) (p<0.001). Among SRDs, the mean age was 41.0 years, 58.2% were male, and 65.4% were white. From 2010 to 2017, HBsAg positivity remained constant (0.1%), whereas anti-HBc and anti-HCV positivity decreased (from 4.7% to 3.9% and from 3.0% to 2.2%, respectively). From 2014 to 2017, HCV RNA positivity decreased from 2.2% to 1.1%.

During 2014–2017, the percentage of SRDs tested by HCV NAT increased from 3.4% to 100.0%. During this period, among all HCV RNA–positive donors, nine (3.5%) were anti-HCV negative (four in 2015, two in 2016, and three in 2017). Although HIV NAT and HBV NAT are not recommended for SRDs, the percentage of SRDs tested for HIV and HBV by NAT increased from 3.3% to 100.0%. Compared with SRDs, IRDs were significantly more likely to be anti-HBc–positive (7.0% versus 4.3%, p<0.001), HBV DNA–positive (0.4% versus 0.1%, p<0.001), anti-HCV–positive (19.1% versus 2.3%, p<0.001), and HCV RNA–positive (14.9% versus 1.2%, p<0.001).

Discussion

During 2010–2017, the number and percentage of IRDs among all deceased donors increased. Similar to persons who die from opioid overdose in the United States, IRDs were more frequently white, male, and aged 25–34 years (*2*). Compared with SRDs, IRDs had higher HCV prevalence as well as a higher number and prevalence of acute HCV infections. Increases in opioid overdose deaths have likely contributed to the increasing number and percentage of IRDs in the United States as reflected by the increase in drug intoxication as mechanism of death among donors.

Some reports suggest underuse of IRD organs (*3*). According to the current guideline, donors are categorized as IRDs if risk behaviors occurred within the 12 months preceding donation (*1*). Use of NAT has greatly reduced the window period of undetectable infection to, on average, 3–5 days for HCV, 11–13 days for HIV, and 20–22 days for HBV (*4*,*5*). Because universal donor NAT testing has been implemented since 2014, reduction of the 12-month period for IRD designation to a shorter interval warrants further consideration. Although this study does not assess the use of donor organs, modifications to current recommendations might increase their use while still protecting recipient safety. These modifications include shortening the 12-month interval to reduce the proportion of donors categorized as IRDs and reassessment of terminology that might currently be contributing to underuse of these organs.

Because of the increased risk for transmission of HBV, HCV, and HIV through transplantation of IRD organs, the guideline recommends posttransplant HBV, HCV, and HIV testing of IRD organ recipients, in addition to donor testing (*1*). Standard posttransplant recipient testing is not otherwise routinely performed. The prevalence of HCV RNA positivity among IRDs (14.9%) was more than 12 times that among SRDs (1.2%). Because IRDs are at higher risk for HCV infection, identifying donor infection risk factors and conveying this information to recipients and their clinicians is important. This might ensure that recipients are screened posttransplant and, if HCV infection is diagnosed, offered treatment. HIV transmission from deceased organ donors to transplant recipients has not been identified in the United States since 2007 (*6*). However, window period HCV transmissions from IRDs have been reported (*7*), and the investigation by CDC of additional donor-derived HBV or HCV transmissions is ongoing. Available data indicate direct-acting antiviral treatment might be safe and effective for transplant recipients with donor-derived HCV infection (*8*). Effective therapy is also available for HIV and HBV donor-derived infection (*9*,*10*).

The findings in this report are subject to at least five limitations. First, these analyses focused on donor characteristics and did not compare SRD and IRD recipient outcomes. Second, data are limited to donors from whom at least one organ was recovered and do not include persons who might have been considered for donation but from whom no organs were recovered. Therefore, the testing results and mechanism of death might not fully reflect all persons considered for organ donation. Third, because IRD status is often determined by interviews of next of kin who might not be fully aware of donor risk behaviors, misclassification bias is possible. Fourth, the HIV Organ Policy Equity (HOPE) Act[††] of 2013 permits the transplantation, under research protocols, of organs from donors with HIV infection to recipients who also have HIV infection. Data were unavailable to determine whether HIV antibody–positive or HIV RNA–positive donations occurred as part of the HOPE Act research studies, but these donors are likely to have been part of research studies covered by the HOPE Act, because donation from organ donors with diagnosed HIV infection is otherwise not permissible in the United States. Finally, the criteria for IRD designation changed with

[††] https://optn.transplant.hrsa.gov/governance/public-comment/changes-to-hope-act-open-variance/.

TABLE 3. Characteristics of deceased standard risk donors (SRDs) (N = 57,782) — Organ Procurement and Transplantation Network, United States, 2010–2017

	2010	2011	2012	2013	2014	2015	2016	2017	Total
Characteristic	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**	**No. (%)**
SRDs (% of all deceased donors)	**7,226 (90.1)**	**7,283 (89.6)**	**7,171 (88.1)**	**7,157 (86.6)**	**6,815 (79.3)**	**7,059 (77.8)**	**7,491 (75.1)**	**7,580 (73.7)**	**57,782 (82.1)**
Mean age (yrs), (SD)	41.0 (18.5)	40.7 (18.4)	40.6 (18.3)	41.0 (18.4)	41.3 (18.3)	40.7 (18.8)	40.8 (18.2)	41.4 (18.1)	**41.0 (18.4)**
Age group (yrs)									
0–17	795 (11.0)	844 (11.6)	781 (10.9)	801 (11.2)	745 (10.9)	839 (11.9)	841 (11.2)	792 (10.5)	**6,438 (11.1)**
18–24	902 (12.5)	865 (11.9)	895 (12.5)	813 (11.4)	741 (10.9)	836 (11.8)	814 (10.9)	816 (10.7)	**6,682 (11.6)**
25–34	929 (12.9)	940 (12.9)	955 (13.3)	971 (13.6)	891 (13.1)	880 (12.5)	1,044 (13.9)	1,063 (14.0)	**7,673 (13.3)**
35–44	1,067 (14.8)	1,101 (15.1)	1,049 (14.6)	1,104 (15.4)	1,041 (15.3)	1,062 (15.0)	1,188 (15.9)	1,147 (15.1)	**8,759 (15.2)**
45–54	1,639 (22.7)	1,672 (23.0)	1,702 (23.7)	1,608 (22.5)	1,582 (23.2)	1,557 (22.1)	1,619 (21.6)	1,651 (21.8)	**13,030 (22.6)**
55–64	1,242 (17.2)	1,283 (17.6)	1,238 (17.3)	1,243 (17.4)	1,243 (18.2)	1,314 (18.6)	1,409 (18.8)	1,501 (19.8)	**10,473 (18.1)**
≥65	652 (9.0)	578 (7.9)	551 (7.7)	617 (8.6)	572 (8.4)	571 (8.1)	576 (7.7)	610 (8.1)	**4,727 (8.1)**
Sex									
Male	4,202 (58.2)	4,207 (57.8)	4,175 (58.2)	4,169 (58.3)	3,973 (58.3)	4,124 (58.4)	4,320 (57.7)	4,437 (58.5)	**33,607 (58.2)**
Female	3,024 (41.9)	3,076 (42.2)	2,996 (41.8)	2,988 (41.8)	2,842 (41.7)	2,935 (41.6)	3,171 (42.3)	3,143 (41.5)	**24,175 (41.8)**
Race									
White	4,751 (65.7)	4,776 (65.6)	4,651 (64.9)	4,657 (65.1)	4,515 (66.2)	4,599 (65.2)	4,912 (65.5)	4,941 (65.2)	**37,802 (65.4)**
Black	1,220 (16.9)	1,188 (16.3)	1,235 (17.2)	1,218 (17.0)	1,043 (15.3)	1,140 (16.1)	1,205 (16.1)	1,170 (15.4)	**9,419 (16.3)**
Hispanic	959 (13.3)	975 (13.4)	945 (13.2)	974 (13.6)	919 (13.5)	983 (13.9)	1,008 (13.5)	1,098 (14.5)	**7,861 (13.6)**
Other*	296 (4.1)	344 (4.7)	340 (4.7)	308 (4.3)	338 (5.0)	337 (4.8)	366 (4.9)	371 (4.9)	**2,700 (4.7)**
Hepatitis B surface antigen									
Positive	7 (0.1)	6 (0.1)	6 (0.1)	7 (0.1)	5 (0.1)	3 (0.1)	5 (0.1)	8 (0.1)	**47 (0.1)**
Negative	7,217 (99.9)	7,277 (99.9)	7,165 (99.9)	7,149 (99.9)	6,809 (99.9)	7,056 (99.9)	7,486 (99.9)	7,572 (99.9)	**57,731 (99.9)**
Hepatitis B core antibody									
Positive	340 (4.7)	318 (4.4)	321 (4.5)	303 (4.2)	285 (4.2)	314 (4.5)	325 (4.3)	295 (3.9)	**2,501 (4.3)**
Negative	6,882 (95.3)	6,964 (95.6)	6,848 (95.5)	6,850 (95.8)	6,529 (95.8)	6,745 (95.5)	7,166 (95.7)	7,285 (96.1)	**55,269 (95.7)**
HCV antibody									
Positive	217 (3.0)	182 (2.5)	181 (2.5)	160 (2.2)	123 (1.8)	145 (2.1)	152 (2.0)	163 (2.2)	**1,323 (2.3)**
Negative	7,006 (97.0)	7,101 (97.5)	6,988 (97.5)	6,997 (97.8)	6,692 (98.2)	6,914 (97.9)	7,338 (98.0)	7,417 (97.8)	**56,453 (97.7)**
HCV RNA by NAT									
Positive	—	—	—	—	5 (2.2)†	78 (1.3)§	98 (1.3)¶	80 (1.1)**	**261 (1.2)**
Negative	—	—	—	—	224 (97.8)	5,991 (98.7)	7,393 (98.7)	7,500 (98.9)	**21,108 (98.8)**
SRDs tested for HCV RNA by NAT	—	—	—	—	229 (3.4)	6,069 (86.0)	7,491 (100.0)	7,580 (100.0)	**21,369 (73.8)**
HIV antibody††									
Positive	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	2 (0.0)	4 (0.1)	6 (0.1)	**13 (0.0)**
Negative	7,220 (100.0)	7,280 (100.0)	7,168 (100.0)	7,153 (100.0)	6,768 (100.0)	6,848 (100.0)	7,331 (99.9)	7,536 (99.9)	**57,304 (100.0)**
HIV RNA by NAT									
Positive	—	—	—	—	0 (0.0)	1 (0.0)	1 (0.0)	2 (0.0)	**4 (0.0)**
Negative	—	—	—	—	225 (100.0)	5,951 (100.0)	7,407 (100.0)	7,578 (100.0)	**21,161 (100.0)**
SRDs tested for HIV RNA by NAT	—	—	—	—	225 (3.3)	5,952 (84.3)	7,408 (98.9)	7,580 (100.0)	**21,165 (73.1)**
HBV DNA by NAT									
Positive	—	—	—	—	1 (0.4)	11 (0.2)	11 (0.1)	7 (0.1)	**30 (0.1)**
Negative	—	—	—	—	227 (99.6)	6,060 (99.8)	7,480 (99.9)	7,573 (99.9)	**21,340 (99.9)**
SRDs tested for HBV DNA by NAT	—	—	—	—	228 (3.3)	6,071 (86.0)	7,491 (100.0)	7,580 (100.0)	**21,370 (73.8)**

Abbreviations: HBV = hepatitis B virus; ; HCV = hepatitis C virus; HIV = human immunodeficiency virus; NAT = nucleic acid test; SD = standard deviation.

* Other include Asian, America Indian/Alaska Native, Native Hawaiian, Multiracial.

† All five (100%) HCV RNA–positive donors were anti-HCV positive.

§ 74 of 78 (94.9%) HCV RNA–positive donors were anti-HCV positive; 4 (5.1%) were negative.

¶ 96 of 98 (98.0%) HCV RNA–positive donors were anti-HCV positive; 2 (2.0%) were negative.

** 77 of 80 (96.3%) HCV RNA–positive donors were anti-HCV positive; 3 (3.8%) were negative.

†† The HIV Organ Policy Equity Act (HOPE Act) of 2013 allows transplantation, under research protocols, of organs from donors infected with HIV into recipients who are also infected with HIV. https://optn.transplant.hrsa.gov/governance/public-comment/changes-to-hope-act-open-variance/.

Summary

What is already known about this topic?

Drug overdose deaths and hepatitis C virus (HCV) infections have increased with the U.S. opioid crisis. The Public Health Service guideline for reducing unintended organ transplantation–associated hepatitis B virus (HBV), HCV, and human immunodeficiency virus (HIV) transmission describes criteria to identify increased risk donors (IRDs).

What is added by this report?

The number and proportion of IRDs have increased since 2010, likely because of the epidemic of opioid overdose deaths. Compared with standard risk donors, IRDs were significantly more likely to have HBV and HCV infection. Rates of nucleic acid testing have reached nearly 100%.

What are the implications for public health practice?

Identification of HBV, HCV, and HIV risk factors among organ donors is critical to mitigate transmission risk and ensure monitoring and appropriate treatment of recipients for posttransplant infection. Nucleic acid testing has substantially reduced the period of undetectable infection.

the 2013 revised guideline (*1*) and might have contributed to the observed increase in IRDs.

An increasing number of organ donors have a history of drug intoxication as the mechanism of death, mirroring the U.S. opioid crisis. These organ donors have high prevalence of HCV infection, but low prevalence of HIV and HBV infections. Identification of risk factors for viral bloodborne pathogen infection among organ donors is nonetheless important so that recipients and their clinicians can be notified and patients can be appropriately screened posttransplant. Prompt identification of posttransplant infection can facilitate early treatment. Given advances in technology and universal NAT implementation among solid organ donors, CDC and HRSA will continue to work with partners to review the current guideline recommendations to assess opportunities for refinement to reduce transmission of viral bloodborne pathogens and increase donor organ use.

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Transgender Identity and Experiences of Violence Victimization, Substance Use, Suicide Risk, and Sexual Risk Behaviors Among High School Students — 19 States and Large Urban School Districts, 2017

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Transgender youths (those whose gender identity* does not align with their sex†) experience disparities in violence victimization, substance use, suicide risk, and sexual risk compared with their cisgender peers (those whose gender identity does align with their sex) (*1*–*3*). Yet few large-scale assessments of these disparities among high school students exist. The Youth Risk Behavior Survey (YRBS) is conducted biennially among local, state, and nationally representative samples of U.S. high school students in grades 9–12. In 2017, 10 states (Colorado, Delaware, Hawaii, Maine, Maryland, Massachusetts, Michigan, Rhode Island, Vermont, Wisconsin) and nine large urban school districts (Boston, Broward County, Cleveland, Detroit, District of Columbia, Los Angeles, New York City, San Diego, San Francisco) piloted a measure of transgender identity. Using pooled data from these 19 sites, the prevalence of transgender identity was assessed, and relationships between transgender identity and violence victimization, substance use, suicide risk, and sexual risk behaviors were evaluated using logistic regression. Compared with cisgender males and cisgender females, transgender students were more likely to report violence victimization, substance use, and suicide risk, and, although more likely to report some sexual risk behaviors, were also more likely to be tested for human immunodeficiency virus (HIV) infection. These findings indicate a need for intervention efforts to improve health outcomes among transgender youths.

In the 2017 YRBS cycle, states and local urban school districts could pilot a question about transgender identity (Box). This question was developed by CDC survey methodologists with input from external experts in transgender health to create a single-item measure to assess the prevalence of transgender identity among high school students. Ten states and nine large urban school districts piloted this question, and these data were pooled for this analysis (131,901 students). Data were weighted to be representative of public school students attending grades 9–12 in each jurisdiction. Survey procedures protected students' privacy, participation was anonymous and voluntary, and local procedures were followed to review and approve the YRBS and obtain parental consent.

To produce prevalence estimates for transgender identity, respondents were categorized based on responses to the pilot question into the following four groups: 1) No, I am not transgender; 2) Yes, I am transgender; 3) I am not sure if I am transgender; and 4) I do not know what this question is asking. To examine behavioral comparisons, respondents were categorized based on responses to the pilot question and the question about sex ("What is your sex?") into the following three groups: 1) cisgender males (male, not transgender); 2) cisgender females (female, not transgender); and 3) transgender students. Because it is unclear whether transgender students' responses to the sex question reflected their sex or gender identity, this analysis could not further disaggregate transgender students. Students who responded that they were not sure if they were transgender or that they did not know what the question was asking were excluded from behavioral comparisons.

Victimization was assessed by students' responses to the following items: in the past 12 months 1) threatened or injured with a weapon at school; 2) experienced sexual dating violence; 3) experienced physical dating violence; 4) bullied at school; 5) electronically bullied; 6) in the past 30 days, felt unsafe at or traveling to or from school; or 7) ever forced to have sexual intercourse. Information on lifetime use of cigarettes, alcohol, marijuana, cocaine, heroin, methamphetamines, ecstasy, or inhalants, and prescription opioid misuse was collected. Suicide risk was assessed by responses to questions about whether, in the past 12 months, the student felt sad or hopeless, considered attempting suicide, made a suicide plan, attempted suicide, or had a suicide attempt treated by a doctor or nurse. Sexual risk behaviors were assessed by students' responses to questions about whether they had ever had sexual intercourse; had first sexual intercourse before age 13 years; had sexual intercourse with four or more persons during their life; had sexual intercourse during the past 3 months (currently sexually active); did not use a condom during last sexual intercourse; did not use any method to prevent pregnancy during last sexual intercourse; drank alcohol or used drugs before last sexual intercourse; and had never been tested for HIV infection.

* Gender identity refers to an individual's sense of their self as male, female, transgender, or something else. Gender identity is distinct from, but related to, gender, or the cultural roles, behaviors, activities, and attributes expected of women and men based on their sex.

† Sex refers to an individual's biologic status as male, female, or something else. Sex is assigned to individuals at birth, and is associated with physical attributes, such as anatomy and chromosomes. This definition was not offered in the YRBS questionnaire.

To examine the prevalence of transgender identity, unadjusted prevalence estimates with 95% confidence intervals (CIs) were calculated using Taylor series linearization for prevalence. To test for differences in behavioral outcomes by gender identity, logistic regression models, controlling for race/ethnicity, grade, and site (school district versus state) produced adjusted prevalence ratios (APRs) with cisgender male students serving as referent group. Post-hoc linear contrast t-tests were used to assess additional between-group differences in outcome prevalence by gender identity. Differences were considered statistically significant if $p<0.05$ or 95% CIs did not include 1.0.

Across the 19 sites, 94.4% (range = 94.0%–94.8%) of students responded "No, I am not transgender"; 1.8% (range = 1.0%–3.3%) responded "Yes, I am transgender"; 1.6% (range = 0.9%–2.5%) responded "I am not sure if I am transgender"; and 2.1% (range = 1.5%–4.7%) responded "I do not know what this question is asking." (Table 1)

The reported prevalence of all experiences assessing violence victimization was higher among transgender students than among both cisgender males and cisgender females, including 23.8% reporting ever being forced to have sexual intercourse and 26.4% having experienced physical dating violence (Table 2). A higher percentage of transgender students also reported lifetime use of all substances except marijuana than did cisgender male and cisgender female students; marijuana use was more prevalent among transgender students than among cisgender male students only. A higher proportion of transgender students reported all suicide risk outcomes than did cisgender students.

Transgender students were more likely than cisgender students to report first sexual intercourse before age 13 years, sexual intercourse with four or more persons than were cisgender students, and no method to prevent pregnancy at last sexual intercourse. Transgender students were more likely than were cisgender females to have ever had sex (43.1% versus 33.2%) and to have drunk alcohol or used drugs before their last sexual intercourse (30.0% versus 17.9%). Transgender students were more likely than were cisgender males to report no condom use during their last sexual intercourse (63.8% versus 37.6%). Transgender students were less likely than cisgender males and cisgender females to have not ever been tested for HIV (70.0% versus 87.4% and 86.9%, respectively).

BOX. Transgender pilot question — Youth Risk Behavior Surveys, 10 U.S. states* and nine large urban school districts,† 2017

Some people describe themselves as transgender when their sex at birth does not match the way they think or feel about their gender. Are you transgender?

A. No, I am not transgender

B. Yes, I am transgender

C. I am not sure if I am transgender

D. I do not know what this question is asking

* Colorado, Delaware, Hawaii, Maine, Maryland, Massachusetts, Michigan, Rhode Island, Vermont, and Wisconsin.

† Boston, Massachusetts; Broward County, Florida; Cleveland, Ohio; Detroit, Michigan; District of Columbia; Los Angeles, California; New York City, New York; San Diego, California; and San Francisco, California.

Discussion

Overall, 1.8% of students enrolled in the participating 10 state and nine urban school districts identified as transgender. This finding is consistent with previous studies of the prevalence of transgender identity among adolescents (*4*,*5*) and points to the utility of this measure to assess transgender identity broadly in a population-based study. Of note, some researchers recommend use of a sex question that includes a definition of sex as well as a gender identity question with five or more options (i.e., the two-step approach) to reliably characterize an individual's current gender (*6*); such refined measures might benefit researchers in assessing within-group differences among transgender persons and aid in better targeting public health interventions.

TABLE 1. Unweighted number and weighted percentage of transgender item responses — 10 U.S. states* and nine large urban school districts,† Youth Risk Behavior Survey, 2017

	Transgender question response							
	No, I am not transgender		Yes, I am transgender		I am not sure if I am transgender		I do not know what this question is asking	
Site	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Selected states (pooled)	90,415	94.6 (94.1–95.1)	2,359	1.9 (1.6–2.1)	2,020	1.6 (1.4–1.9)	1,998	1.9 (1.7–2.2)
Large urban school districts (pooled)	28,388	93.9 (93.3–94.5)	486	1.6 (1.4–2.0)	499	1.6 (1.4–1.8)	908	2.9 (2.5–3.2)
State and school district data (pooled)	118,803	94.4 (94.0–94.8)	2,845	1.8 (1.6–2.0)	2,519	1.6 (1.4–1.8)	2,906	2.1 (1.9–2.4)

* Colorado, Delaware, Hawaii, Maine, Maryland, Massachusetts, Michigan, Rhode Island, Vermont, and Wisconsin.

† Boston, Massachusetts; Broward County, Florida; Cleveland, Ohio; Detroit, Michigan; District of Columbia; Los Angeles, California; New York City, New York; San Diego, California; and San Francisco, California.

TABLE 2. Unadjusted prevalence (%) and adjusted prevalence ratios (APRs) of violence victimization, substance use, suicide risk, and sexual risk among cisgender male, cisgender female, and transgender students — 10 U.S. states* and nine large urban school districts,† Youth Risk Behavior Surveys, 2017

Health risk behaviors or experiences (no. of sites that asked question)	Cisgender students				Transgender students	
	Males		Females			
	% (95% CI)	APR (95% CI)	% (95% CI)	APR (95% CI)§	% (95% CI)	APR (95% CI)§
Violence victimization						
Felt unsafe at or traveling to/from school (17)¶	4.6 (4.0–5.2)	1.0 (ref)	7.1 (6.3–8.0)	1.56** (1.33–1.82)	26.9 (21.4–33.1)	5.44**,†† (4.09–7.23)
Threatened or injured with a weapon at school (17)§§	6.4 (5.8–7.0)	1.0 (ref)	4.1 (3.6–4.6)	0.63** (0.55–0.73)	23.8 (20.0–28.1)	3.39**,†† (2.69–4.27)
Ever forced to have sexual intercourse (18)¶¶	4.2 (3.6–4.9)	1.0 (ref)	10.5 (9.5–11.6)	2.55** (2.09–3.11)	23.8 (19.0–29.3)	5.45**,†† (4.11–7.21)
Experienced sexual dating violence (15)***	3.5 (3.0–4.2)	1.0 (ref)	12.0 (10.8–13.3)	3.51** (2.91–4.24)	22.9 (17.4–29.5)	6.42**,†† (4.62–8.91)
Experienced physical dating violence (19)†††	5.8 (5.1–6.5)	1.0 (ref)	8.7 (8.0–9.4)	1.50** (1.32–1.71)	26.4 (21.1–32.5)	4.15**,†† (3.13–5.48)
Bullied at school (18)§§§	14.7 (13.8–15.7)	1.0 (ref)	20.7 (19.6–21.8)	1.42** (1.31–1.53)	34.6 (29.8–39.8)	2.33**,†† (1.95–2.78)
Electronically bullied (19)¶¶¶	10.2 (9.5–10.9)	1.0 (ref)	19.3 (18.5–20.2)	1.90** (1.76–2.05)	29.6 (24.4–35.4)	2.90**,†† (2.40–3.49)
Substance use						
Cigarettes, lifetime use (12)	23.2 (21.0–25.6)	1.0 (ref)	22.0 (19.9–24.3)	0.94 (0.86–1.03)	32.9 (26.4–40.2)	1.34**,†† (1.07–1.69)
Alcohol, lifetime use (16)	53.3 (51.3–55.4)	1.0 (ref)	62.8 (60.9–64.6)	1.17** (1.14–1.21)	70.0 (63.7–75.6)	1.31**,†† (1.20–1.43)
Marijuana, lifetime use (14)	34.1 (31.9–36.4)	1.0 (ref)	38.0 (35.7–40.3)	1.10** (1.05–1.16)	43.8 (36.9–51.0)	1.26** (1.06–1.49)
Cocaine, lifetime use (17)	4.3 (3.5–5.3)	1.0 (ref)	2.6 (2.2–3.0)	0.60** (0.47–0.76)	27.2 (22.8–32.0)	5.99**,†† (4.54–7.92)
Heroin, lifetime use (16)	2.2 (1.9–2.7)	1.0 (ref)	0.7 (0.5–1.0)	0.31** (0.22–0.43)	26.1 (22.2–30.3)	10.23**,†† (8.01–13.1)
Methamphetamines, lifetime use (13)	2.3 (1.8–2.9)	1.0 (ref)	1.0 (0.7–1.3)	0.42** (0.28–0.64)	24.9 (20.9–29.3)	9.75**,†† (7.05–13.5)
Ecstasy, lifetime use (12)	3.6 (3.1–4.2)	1.0 (ref)	2.4 (2.1–2.8)	0.67** (0.54–0.83)	31.6 (26.8–36.8)	7.87**,†† (6.03–10.3)
Inhalants (11)****	6.0 (4.9–7.5)	1.0 (ref)	4.9 (4.2–5.8)	0.82 (0.66–1.02)	31.1 (24.2–38.9)	4.79**,†† (3.43–6.67)
Prescription opioid misuse (17)††††	11.5 (10.2–12.9)	1.0 (ref)	12.3 (11.1–13.7)	1.08 (0.96–1.22)	35.9 (31.3–40.7)	2.95**,†† (2.41–3.60)
Suicide risk						
Felt sad or hopeless (19)§§§§	20.7 (19.8–21.7)	1.0 (ref)	39.3 (38.0–40.7)	1.91** (1.81–2.00)	53.1 (47.7–58.4)	2.58**,†† (2.32–2.87)
Considered attempting suicide (18)¶¶¶¶	11.0 (10.2–11.9)	1.0 (ref)	20.3 (19.3–21.3)	1.85** (1.70–2.01)	43.9 (38.3–49.7)	3.95**,†† (3.39–4.60)
Made a suicide plan (16)*****	10.4 (9.4–11.4)	1.0 (ref)	16.0 (15.2–16.8)	1.56** (1.42–1.72)	39.3 (33.1–45.8)	3.72**,†† (3.10–4.46)
Attempted suicide (18)†††††	5.5 (4.9–6.1)	1.0 (ref)	9.1 (8.3–10.1)	1.70** (1.51–1.93)	34.6 (27.1–42.9)	6.30**,†† (4.81–8.24)
Had a suicide attempt treated by a doctor or nurse (14)§§§§§	2.1 (1.8–2.5)	1.0 (ref)	2.5 (2.0–3.1)	1.24 (0.92–1.67)	16.5 (10.9–24.3)	7.55**,†† (4.79–11.9)
Sexual risk						
Ever had sexual intercourse (17)	35.4 (33.4–37.3)	1.0 (ref)	33.2 (31.4–35.0)	0.93** (0.89–0.98)	43.1 (35.1–51.4)	1.21†† (0.98–1.50)
Had first sexual intercourse before age 13 years (19)	4.5 (3.8–5.2)	1.0 (ref)	1.5 (1.3–1.8)	0.34** (0.28–0.42)	14.9 (11.0–19.9)	3.17**,†† (2.16–4.66)
Had sexual intercourse with ≥4 persons (18)	8.9 (7.8–10.2)	1.0 (ref)	5.9 (5.2–6.7)	0.66** (0.56–0.78)	16.4 (11.9–22.0)	1.64**,†† (1.11–2.42)
Currently sexually active (18)¶¶¶¶¶	23.1 (21.4–24.8)	1.0 (ref)	25.8 (24.1–27.6)	1.11** (1.05–1.18)	27.8 (21.8–34.7)	1.21 (0.94–1.57)
Did not use condom during last sexual intercourse (18)	37.6 (34.9–40.5)	1.0 (ref)	48.9 (45.8–52.0)	1.30** (1.19–1.42)	63.8 (49.9–75.6)	1.69** (1.33–2.15)
Did not use any method to prevent pregnancy during last sexual intercourse (18)******	12.8 (10.8–15.0)	1.0 (ref)	13.0 (11.1–15.1)	1.06 (0.87–1.30)	29.7 (21.5–39.5)	2.20**,†† (1.50–3.23)
Drank alcohol or used drugs before last sexual intercourse (17)	19.2 (17.0–21.6)	1.0 (ref)	17.9 (15.9–20.1)	0.91 (0.76–1.09)	30.0 (20.8–41.2)	1.48†† (0.99–2.21)
Never been tested for HIV (16)†††††	87.4 (86.2–88.5)	1.0 (ref)	86.9 (85.8–87.9)	1.00 (0.98–1.01)	70.0 (64.4–75.0)	0.82**,†† (0.76–0.89)

See table footnotes on the next page.

TABLE 2. (*Continued*) Unadjusted prevalence (%) and adjusted prevalence ratios (APRs) of violence victimization, substance use, suicide risk, and sexual risk among cisgender male, cisgender female, and transgender students — 10 U.S. states* and nine large urban school districts,† Youth Risk Behavior Surveys, 2017

Abbreviations: CI = confidence interval; HIV = human immunodeficiency virus; ref = referent.

* Colorado, Delaware, Hawaii, Maine, Maryland, Massachusetts, Michigan, Rhode Island, Vermont, and Wisconsin.

† Boston, Massachusetts; Broward County, Florida; Cleveland, Ohio; Detroit, Michigan; District of Columbia; Los Angeles, California; New York City, New York; San Diego, California; and San Francisco, California.

§ Statistical significance is indicated when p<0.05 or 95% CI for APR does not include 1.0; % = unadjusted prevalence; APR adjusted for race/ethnicity, grade, and site. Referent group is cisgender male students. Each outcome was assessed by more than half of the 19 sites. Items "did not use a condom during last sexual intercourse,""did not use any method to prevent pregnancy," and "drank alcohol or used drugs before last sex" were tested only among sexually active students.

¶ Did not go to school because they felt unsafe at school or on their way to or from school on at least 1 day during the 30 days before the survey.

** Significantly different from cisgender male students.

†† Significantly different from cisgender female students.

§§ Threatened or injured with a weapon on school property during the 12 months before the survey.

¶¶ Ever physically forced to have sexual intercourse when they did not want to.

*** Being forced to do sexual things they did not want to do by someone they were dating or going out with ≥1 times during the 12 months before the survey, among students who dated or went out with someone during the 12 months before the survey.

††† Being physically hurt on purpose by someone they were dating or going out with ≥1 times during the 12 months before the survey, among students who date or went out with someone during the 12 months before the survey.

§§§ Bullied on school property during the 12 months before the survey.

¶¶¶ Bullied through texting, Instagram, Facebook, or other social media during the 12 months before the survey.

**** Sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high, one or more times during their life.

†††† Ever took prescription pain medicine without a doctor's prescription or differently than how a doctor told you to use it? (Counts drugs such as codeine, Vicodin, OxyContin, Hydrocodone, and Percocet.)

§§§§ Felt so sad or hopeless almost every day for ≥2 weeks in a row that they stopped doing some usual activities during the 12 months before the survey.

¶¶¶¶ Seriously considered attempting suicide during the 12 months before the survey.

***** Made a plan about how they would attempt suicide during the 12 months before the survey.

††††† Attempted suicide one or more times during the 12 months before the survey.

§§§§§ Attempted suicide that resulted in an injury, poisoning, or overdose that had to be treated by a doctor or nurse during the 12 months before the survey.

¶¶¶¶¶ Had sexual intercourse with at least one person during the 3 months before the survey.

****** Question asked about method used for pregnancy prevention by "you or your partner."

†††††† Never been tested for human HIV, the virus that causes acquired immunodeficiency syndrome (AIDS) (does not count if donated blood).

The results of this study validate findings from smaller clinical and web-based studies that, at a population level, transgender students are at disproportionately higher risk than are cisgender students for violence victimization, substance use, and suicide risk (*1*–*3*). The prevalence of reported substance use (e.g., 27.1%, 26.1%, 24.9%, and 35.9% reporting lifetime use of cocaine, heroin, methamphetamines, and prescription opioid misuse, respectively) and suicide risk (e.g., 34.6% attempting suicide in the last 12 months) are concerning. Given that violence victimization is a documented risk factor for substance use and suicide risk (*7*), implementation of interventions focused on reducing the victimization of transgender adolescents might be a key strategy for improving overall health.§

Some examples of elevated sexual risk emerged among transgender students. More transgender than cisgender students reported first sexual intercourse before age 13 years and having had four or more sex partners, and more transgender students than cisgender female students reported ever having had sexual intercourse and use of alcohol or drugs before last sexual intercourse. Transgender students were more likely than were cisgender students to forego pregnancy prevention at last sexual intercourse and were less likely than were cisgender males to use a condom at last sexual intercourse; however, without further information about the sex and gender identities of these youths and their partners, the risk implications of these results are uncertain and should be interpreted with caution. Transgender students were more likely to have ever received an HIV test, an important protective behavior, given the known higher HIV risk experienced by this population (*3*).

Summary

What is already known about this topic?

Convenience samples indicate that transgender youths appear to be at higher risk for violence victimization, substance use, suicide risk, and sexual risk behaviors than are cisgender youth.

What is added by this report?

Population-based survey data from 10 state and nine urban school districts found that an average of 1.8% of high school students identify as transgender. Transgender students were more likely than were cisgender students to report violence victimization, substance use, and suicide risk, and, although generally more likely to report sexual risk behaviors, were also more likely to report having been tested for human immunodeficiency virus.

What are the implications for public health practice?

Coordinated intervention efforts to improve health outcomes among transgender youth are warranted.

§ CDC has a suite of violence prevention technical packages which can be adapted for such use. https://www.cdc.gov/violenceprevention/pub/technical-packages.html.

The findings in this report are subject to at least three limitations. First, because of uncertainty as to whether transgender students responded to the sex question with their sex or gender identity, this analysis could not disaggregate transgender students to explore within-group differences in behavioral outcomes (e.g., a transgender student who was assigned the sex male at birth but currently identified as female might not know what response to provide on the existing sex question). Second, because YRBS is a school-based survey, students with the highest risk for these outcomes might have dropped out, and analyses might underestimate observed associations between risk behaviors and transgender identity (*8*). Finally, because YRBS is a cross-sectional survey, causation cannot be inferred from the findings.

Transgender youths in high school appear to face serious risk for violence victimization, substance use, and suicide, as well as some sexual risk behaviors, indicating a need for programmatic efforts to better support the overall health of transgender youths. Taking steps to create safe learning environments (*9*) and provide access to culturally competent physical and mental health care (*10*) might be important first steps to improving the health of transgender youths. Continued research into the health of transgender youths and development of effective intervention strategies are warranted.

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Scurvy Outbreak Among South Sudanese Adolescents and Young Men — Kakuma Refugee Camp, Kenya, 2017–2018

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Scurvy is a relatively rare micronutrient deficiency disease that can occur among refugees dependent on food aid (*1*). Inadequate access to fresh fruits and vegetables in refugee camps can result in scurvy (*2*,*3*). Kakuma Refugee Camp in Kenya's Turkana District is home to 148,000 refugees, mostly from Somalia and South Sudan, who receive food assistance. In August 2017, a number of South Sudanese adolescent and young adult male refugees were evaluated at a health clinic in the camp for calf pain, chest pain, and gingival swelling. Because the symptoms were nonspecific, no diagnosis was made, and some patients received antibiotics and analgesics. All were managed as outpatients, but symptoms did not improve. During subsequent months, more young men with similar symptoms were reported. On January 20, 2018, the United Nations High Commissioner for Refugees (UNHCR) was informed and conducted clinical examinations. Signs and symptoms included lower limb pain and swelling (in some cases involving joints), lethargy, fatigue, gingival swelling and pain, hyperkeratotic skin changes, and chest pain. Based on these clinical findings, micronutrient deficiency, particularly vitamin C deficiency (scurvy), was considered a possible diagnosis, and an investigation of a possible outbreak was conducted. The suspected scurvy cases all occurred in young men from South Sudan who were living and cooking together in one geographic section of the camp. All patients who received treatment with vitamin C noted improvement of symptoms within <1 week. Patients were provided with food and cash assistance, the latter to allow dietary diversification (i.e., fresh fruits and vegetables). However, both forms of assistance were inadequate to allow access to sufficient amount of calories and the dietary diversification needed for intake of micronutrients, such as vitamin C. It is important to consider these needs when determining the amount of food or cash assistance provided to adolescents and young adult male refugees.

On January 26, 2018, serum specimens were collected from three of the patients with suspected scurvy, and test results indicated vitamin C levels of 2.89 mg/L, 3.06 mg/L, and 2.71 mg/L (normal = 2–14 mg/L); deficiency is defined as a vitamin C level <2mg/L (*1*). Levels of vitamins B1, B2, B6, and B12 in all three patients were normal. Although the serum vitamin C levels were within the low-normal range, these, in combination with the clinical signs and symptoms, suggested scurvy. Therefore, in February 2018, UNHCR requested assistance from CDC to investigate the suspected scurvy outbreak in the Kakuma camp.

Investigation and Findings

Two health specialists from CDC and UNHCR conducted an outbreak investigation during March 11–17, 2018. A suspected scurvy case was defined as the occurrence of lower limb, knee joint, or ankle swelling, and at least two of the following signs or symptoms: calf pain, shin pain, knee joint pain, or gingivitis in a person of any age (*2*,*4*). Because the South Sudanese frequently have very dark skin, the typical dermatologic symptom of petechial hemorrhage was not included in the case definition.

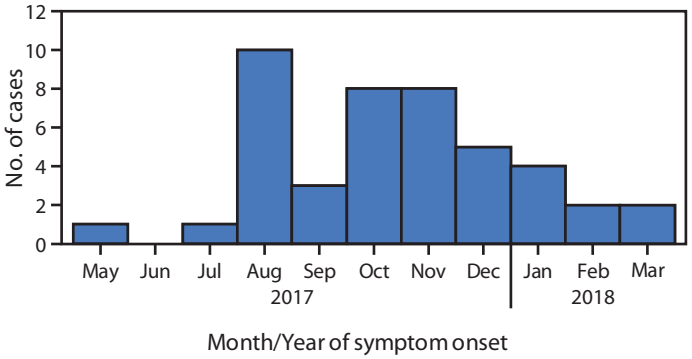
Forty-five patients with suspected scurvy were identified and interviewed using a questionnaire developed by investigators to obtain information on symptoms and diet, with a recall period of 6 months. For a subset of 14 patients, the age structure of the household was analyzed. Additional interviews were conducted with staff members from UNHCR; the World Food Programme (WFP); the nongovernmental organization responsible for health care in the camp; community health volunteers; community leaders; and food shop owners who interacted with the patients. Dietary intake was estimated using WFP's information on provided food rations and NutVal 4.1, a free software program for calculating the nutritional content of food rations (www.nutval.net/).

At the time of this investigation, all refugees in Kakuma received food assistance, consisting of cereal, pulses, fortified corn-soy blend (CSB+),* and vitamin A–fortified oil. By WFP standards, a food ration should provide 2,100 kcal per person per day (pppd), but after 2015, a part of the cereal component of the ration was replaced by electronic cash (e-cash)† to provide dietary diversification and choice. In 2017 and 2018, one-person households received a 500 Kenyan Shillings (KSh)/pppd and food ration of 900–1,400 kcal/pppd. Households of ≥2 persons received 300 KSh/pppd and a food ration of 900–1,700 kcal/pppd.§ The variations in the food assistance from 2015 onwards resulted from shortages of commodities and funding shortfalls.

Among the 45 patients with suspected scurvy, date of symptom onset was known for 44; among these, 29 (66%) reported onset during August–November 2017 (Figure 1).

* Mix of corn and soy flour fortified with micronutrients.
† Bamba Chakula or "get your food" recipients were instructed to buy their own (preferably nutritionally adequate) food.
§ 100 KSh = approximately 1 USD.

FIGURE 1. Suspected scurvy cases among South Sudanese refugees (N = 45),* by month and year of symptom onset — Kakuma Refugee Camp, Kenya, May 2017–March 2018



* Date of symptom onset was missing for one patient.

All 45 patients with suspected scurvy were adolescent and young adult male refugees from South Sudan who had arrived in Kakuma during 2012–2017; 33 (73%) had arrived in 2014 or later. The median age was 19 years (range = 12–32) (Figure 2). Approximately 58% of patients reported swelling of the lower limb, 53% ankle swelling, and 42% lower limb pain (Figure 3). Interviews with health personnel and patients found that approximately seven to 10 patients had been unable to walk. Forty of the 45 patients with suspected scurvy were treated with vitamin C.

The median household size of patients with suspected scurvy was five persons (range = one to 15). Among the subset of 14 households for which age was collected, nine (64.3%) included only adolescents and young men aged 13–22 years; only five households included a female, only one of whom was an adult.

All patients with suspected scurvy reported that they ate one meal per day. None had income from work or received any remittances, and all reported that rather than using the e-cash to diversify their diets, they used the full e-cash amount to purchase staple foods (e.g., cereals and pulses) and sometimes salt. Forty-three (96%) patients reported that they had not purchased vegetables, fruits, or potatoes since their arrival in Kakuma and used the e-cash to supplement their diet with cereals and pulses, which provided an additional 870–1,450 kcal/pppd.¶

All patients who received treatment with vitamin C** noted improvement of symptoms within <1 week, particularly reduction in swelling of knee and ankle joints and shin pain. All patients who previously had been unable to walk were able to do so after treatment.

In response to this outbreak, in April 2018, WFP tested the amount of vitamin C in CSB+, after simulating the CSB+ preparation in a laboratory setting. The raw product contains 90 mg vitamin C per 100 g, and each refugee received 40 g CSB+ per day (equivalent to 36 mg vitamin C per day). The cooking simulation demonstrated that vitamin C retention after preparation was <16%; thus, intake through consumption would be <6 mg vitamin C per day, which is insufficient to prevent deficiency (Food Safety and Quality Unit, World Food Programme, unpublished data, 2018).

¶ If all e-cash is transformed into food (two thirds sorghum and one third split peas); 300 Ksh provides 190 g sorghum grain/pppd and 67 g of split peas/pppd, amounting to 870 kcal/pppd; 500 Ksh provides 317 g sorghum grain/pppd and 110 g of split peas/pppd amounting to 1,450 kcal/pppd.

** Oral treatment with vitamin C had been provided by local health clinic in dosages varying from 200 mg to 300 mg daily for 1–3 weeks. However, the investigation resulted in the change in dosage to 600 mg per day for 3 days, followed by 200 mg per day for 11 days.

FIGURE 2. Age distribution of patients with suspected scurvy (N = 45) — Kakuma Refugee Camp, Kenya, 2017–2018

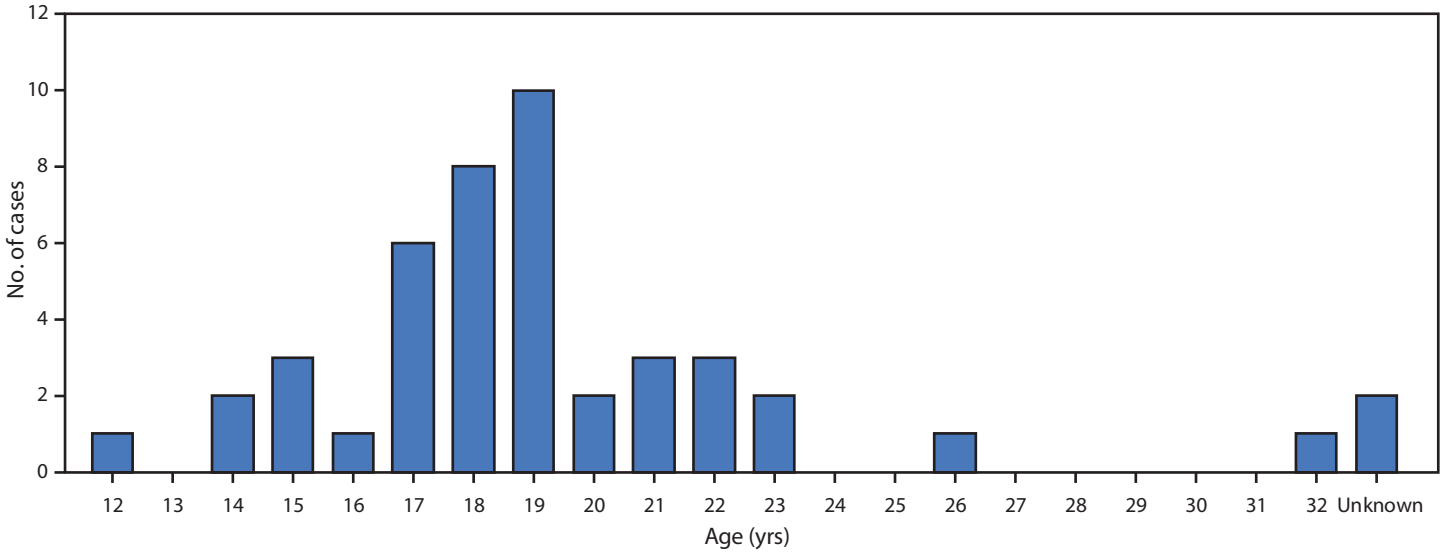
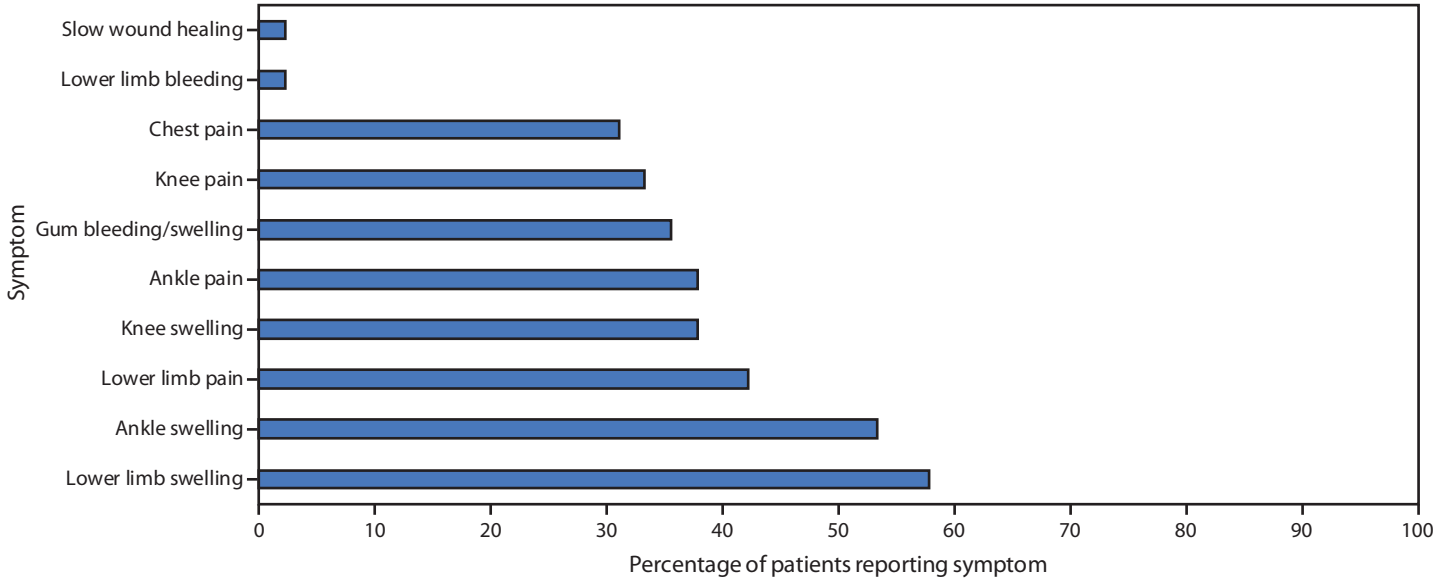


FIGURE 3. Percentage of South Sudanese refugees with suspected scurvy (N = 45), by selected reported symptoms* — Kakuma Refugee Camp, Kenya, 2017–2018



* Patients could report multiple symptoms.

Discussion

In 2017, an outbreak of scurvy was identified in Kakuma Refugee Camp; the diagnosis was based on clinical manifestations, dietary history, and response to treatment. Although chest pain is not often described as a symptom of scurvy in this age group, it was frequently reported in this outbreak. This pain is believed to have resulted from the effect of scurvy on the collagen-containing cartilage in the distal rib ends (costochondral junctions). The actual date of onset of the outbreak remains unknown, but there was an increasing number of cases during August–November 2017. The outbreak was ongoing in early March 2018, although the number of cases had declined.

Scurvy is not new to refugee settings in which a limited amount of fresh foods is available or affordable and has previously been documented in Kakuma Refugee Camp, with outbreaks reported during 1995–1997 (*5*) and in 2003 (*6*). Vitamin C deficiency has also been described among refugees and imprisoned male populations in similar geographic areas (*2–4*,*7*).

The energy requirements for males aged 14–18 years and 18–30 years are 3,000–3,400 kcal per day and 2,550–3,900 kcal per day, respectively (*8*), based on moderate physical activity (males aged 14–18 years) and active to moderately active physical activity (men aged 18–30 years). The food ration provided in the camp supplied 900–1,700 kcal/pppd; with all e-cash used to purchase sorghum and split peas, an additional 870–1,450 kcal/pppd was potentially available, for a maximum theoretical intake of 1,800–2,900 kcal/pppd, depending upon household size. Thus, the food ration met only half of the required caloric needs. Because the e-cash intended for dietary diversification was not used to purchase fresh foods, such as vitamin C–rich vegetables and fruits, but rather to complement the food rations with more calorically dense and cheaper staple foods to secure the missing calories, vitamin C deficiency resulted. The diet of patients with suspected scurvy contained, on average, <10 mg vitamin C per day, which is insufficient to prevent scurvy (*1*). Despite previous assumptions, the fortified commodity, CSB+, was not a sufficient source of vitamin C as losses during preparation were much higher than initially estimated (*9*,*10*). The geographic clustering of suspected cases likely resulted from the relatively higher number of young men living and cooking together in one area of the camp and sharing their limited food rations and e-cash.

The findings in this report are subject to at least two limitations. First, symptoms were self-reported. Second, the investigation took place in the aftermath of the outbreak. The focus was on identifying the cause of the outbreak and possible solutions.

Provision of food assistance in refugee settings is often based on average household composition, factoring in age, sex, and caloric needs. In this investigation, the adolescent and young males had very high nutritional needs compared with persons in an average household. These differences in household demographics demonstrate that simply providing an average amount of calories calculated on assumed household demographics is inadequate to meet nutritional requirements. In addition to food rations, refugees were provided with e-cash

Summary

What is already known about this topic?

Inadequate access to fresh fruits and vegetables in refugee camps can result in scurvy.

What is added by this report?

An outbreak of scurvy occurred among adolescent and young adult male South Sudanese refugees who had been provided electronic cash to supplement their diets. However, rather than purchasing fresh foods rich in vitamin C but lower in calories, they selected more calorie-dense cereal and pulses to meet their caloric needs. Symptoms resolved after vitamin C treatment.

What are the implications for public health practice?

The type of food purchased with electronic cash might not meet caloric and micronutrient needs. Providing the standard provision of 2,100 kcal/person/day is insufficient for refugees with higher caloric needs, and it is important to consider these needs when determining the amount of food or cash assistance provided to adolescents and young adult male refugees.

to purchase their own food to add diversity and choice to their diet. However, this investigation indicated that for adolescent and young adult male refugees, both forms of assistance were inadequate to allow access to sufficient amount of calories and the dietary diversification needed for intake of micronutrients, such as vitamin C. It is important to consider these needs when determining the amount of food or cash assistance provided to adolescents and young adult male refugees.

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Notes from the Field

Outbreak of Listeriosis Likely Associated with Prepackaged Caramel Apples — United States, 2017

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On December 1, 2017, PulseNet, CDC's molecular subtyping network for foodborne disease surveillance, identified a cluster of three *Listeria monocytogenes* clinical isolates with indistinguishable pulsed-field gel electrophoresis (PFGE) pattern combinations. These isolates were closely related to one another by whole-genome multilocus sequence typing within three allele differences (range = 0–3 alleles), indicating that the infections were likely from the same source. CDC, the Food and Drug Administration (FDA), and state and local health departments initiated a multistate investigation. An outbreak case of listeriosis was defined as an infection with *L. monocytogenes,* with an isolate that was indistinguishable by PFGE and closely related by whole-genome multilocus sequence typing to the outbreak strain isolated during October–December 2017.

The cases corresponding to the three isolates were identified in Illinois, Iowa, and Michigan. Isolation dates ranged from October 15, 2017, to October 29, 2017. Patients ranged in age from 55 to 71 years (median = 69 years), and all three patients were male. All patients were hospitalized for listeriosis; no deaths were reported. PulseNet was queried routinely for new isolate matches during the investigation, and no additional cases were identified.

Interviews were conducted with all three patients or their surrogates using the standard *Listeria* Initiative questionnaire (*1*), which asks about a variety of foods consumed in the month preceding illness onset. Grocery store receipts were collected for the patient in Michigan. Review of reported exposures indicated that all three patients had consumed prepackaged caramel apples purchased from retail establishments in the month preceding illness onset. A case-case analysis was performed comparing exposure frequencies for all food items included in the *Listeria* Initiative questionnaire for the three outbreak-associated cases with exposure frequencies for 186 sporadic cases of listeriosis from the same states reported to CDC since 2006. Caramel apple consumption was significantly higher among patients included in the outbreak, compared with that among patients with sporadic illnesses (odds ratio = 21.7; 95% confidence interval = 2.3–infinity). None of the interviewed patients had leftover caramel apples in their home for testing.

State and local officials collected records at two of the three retail locations where caramel apples had been purchased. All three retailers sold the same brand of caramel apples (brand A). The product was packaged in a plastic clamshell containing three caramel apples, each on a stick. Caramel apples were seasonal products that were only available for a short period in the fall at two of the retail locations. However, the retail location where the Illinois patient purchased caramel apples had the product in stock at the time of the investigation. Eight packages of caramel apples were collected for testing by the Illinois Department of Public Health, but *L. monocytogenes* was not detected in any samples. It was not known whether the tested caramel apples were from the same lots as those consumed by the ill persons in this outbreak.

During an inspection at the caramel apple production facility, FDA reviewed records and practices and collected environmental samples for testing. No significant food safety concerns were observed. None of the environmental swabs yielded *L. monocytogenes*. Environmental swabs collected at a single whole apple supplier yielded *L. monocytogenes*, but it was not the outbreak strain. Traceback activities did not implicate a specific lot or supplier of whole apples used in brand A caramel apple production during the period of interest.

No additional outbreak-associated illnesses were identified during the investigation. In light of the limited shelf life of the product (reported by the production facility to be 15 days), it was unlikely that caramel apples consumed by ill persons in this outbreak would have still been available for purchase or in persons' homes at the time of the investigation. Because there was no evidence to suggest an ongoing risk to the public, no public warning was issued by federal or state agencies.

Although the outbreak strain of *L. monocytogenes* was not isolated from caramel apples or their production environment, the epidemiologic evidence indicated that caramel apples were the suspected vehicle in this outbreak. All outbreak-associated ill persons consumed a specific brand of a relatively uncommon food product in the month before their illness onset, and all were infected with indistinguishable *L. monocytogenes* strains. Caramel apples were previously implicated in a large multistate outbreak of listeriosis during 2014–2015, caused by contamination of whole apples (*2*). Ready-to-eat food processors, including those that make caramel apples, could consider the introduction and persistence of *L. monocytogenes* in food production environments as a potential hazard and mitigate that risk through appropriate environmental monitoring and

preventive controls (*3*). Further research into the control of *L. monocytogenes* in fresh produce, including fresh apples, might help identify prevention strategies to reduce or eliminate the pathogen in some ready-to-eat foods.

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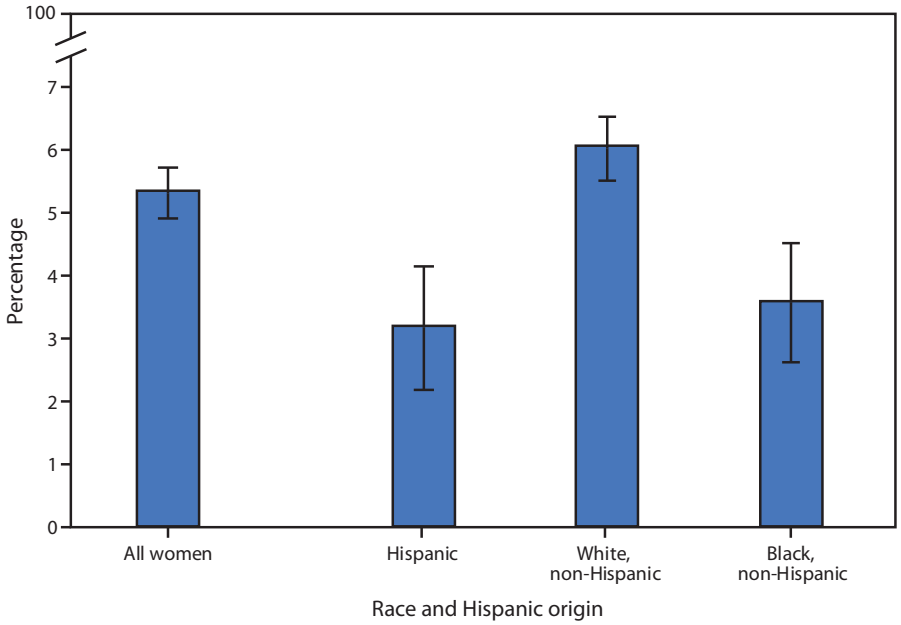
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of U.S. Women Aged 50–74 Years Who Have Ever Had Breast Cancer,† by Race and Hispanic Origin§ — National Health Interview Survey, 2015–2017¶



* With 95% confidence intervals indicated with error bars.
† Based on the questions "Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?" and "What kind of cancer was it?"
§ Refers to persons who are of Hispanic or Latino origin and may be of any race or combination of races. "Non-Hispanic" refers to persons who are not of Hispanic or Latino origin, regardless of race.
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey.

During 2015–2017, 5.3% of U.S. women aged 50–74 years had ever been told they had breast cancer. Non-Hispanic white women were more likely to have ever been told they had breast cancer (6.1%) compared with Hispanic women (3.2%) and non-Hispanic black women (3.6%). There was no significant difference in the prevalence of breast cancer between Hispanic and non-Hispanic black women.

Source: National Health Interview Survey, 2015–2017 combined. https://www.cdc.gov/nchs/nhis.htm.

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