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Emergency Department Visits for Suicidal Ideation and Self-Harm in Rural and Urban Youth

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Abstract

Objectives: To compare emergency department (ED) visit rates for suicidal ideation and/or self-harm among youth by urban-rural location of residence.

Study design: Retrospective analysis of ED visits for suicidal ideation and/or self-harm by youth age 5-to-19 years (N=297,640) in the 2016 Nationwide Emergency Department Sample, a representative sample of all U.S. ED visits. We used weighted Poisson generalized linear models to compare population-based visit rates by urban-rural location of patient residence, adjusted for age, sex, and U.S. Census region. For self-harm visits, we compared injury mechanisms by urban-rural location.

Results: Among ED visits for suicidal ideation and/or self-harm, the median age was 16 years, 65.9% were female, 15.9% had a rural location of patient residence, and 0.1% resulted in mortality. The adjusted ED visit rate for suicidal ideation/or and self-harm did not differ significantly by urban-rural location. For the subset of visits for self-harm, the adjusted visit rate was significantly higher in small metropolitan (aIRR 1.39, 95% CI 1.01, 1.90), micropolitan (aIRR 1.46, 95% CI 1.10, 1.93), and noncore areas (aIRR 1.39, 95% CI 1.03, 1.87) compared to large metropolitan areas. When stratified by injury mechanism, ED visit rates were higher among youth living in rural than in urban areas for self-inflicted firearm injuries (aIRR = 3.03, 95% CI 1.32, 6.74).

Conclusions: Compared with youth living in urban areas, youth living in rural areas had higher ED visit rates for self-harm, including self-inflicted firearm injuries. Preventive approaches for self-harm based in community and ED settings might help address these differences.

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Keywords

Suicide; Self-Harm; Emergency Medicine; Rural Health

INTRODUCTION

Suicide is the second leading cause of death among youth age 10-to-19 years in the United States (U.S.), with rates rising over the last decade.[1] Youth living in rural areas are nearly twice as likely to die by suicide; the rural-urban disparity in youth suicide rates has been widening.[2] Contributors to youth suicides in rural areas are varied and may include mental health workforce shortages, higher community poverty, and increased access to lethal means such as firearms.[2–4] Many youth who die by suicide visit the emergency department (ED) in the months preceding their death, often for mental health concerns such as suicidal ideation or self-harm.[5,6] One-third of adolescents with suicidal ideation will go on to attempt suicide within 12 months, and suicide attempts increase the risk of subsequent death by suicide.[7,8] Non-suicidal self-harm in adolescents, particularly when frequent or using several different methods, is also associated with increased risk of suicide attempts and deaths.[9] ED visits for suicidal ideation and self-harm among youth have doubled from 2007 to 2015.[10,11]

Studying differences in ED visits for suicidal ideation and self-harm in rural versus urban areas provides an opportunity to identify how youth at risk for suicide interact with the healthcare system and to ensure that approaches to suicide prevention based in ED and community settings appropriately address geographic variation across populations.[12] ED suicide prevention efforts may include screening for suicidal ideation, brief lethal means restriction counseling, timely access to mental health evaluation on-site or via telepsychiatry, and mental health referral assistance.[13–16] Broader community efforts for high-risk geographic areas could focus on integration of mental health care into the medical home, mental health workforce development, and supporting at-risk youth in the community.[17] Regional differences have been noted among youth ED visits for mental health conditions, with the highest visit rates in the Midwest and lowest in the South.[18] A nationally representative study of youth mental health ED visits found a lower visit rate in rural areas, but this study examined all mental health conditions rather than focusing on suicidal ideation and self-harm.[10] Higher rates of hospitalization for self-inflicted youth firearm injuries have been described in rural than in urban areas, but other specific mechanisms of self-harm were not studied and ED visits that did not lead to hospitalization were not included.[19] The objectives of our study were to examine differences in ED visit characteristics for youth suicidal ideation and self-harm in rural versus urban areas, to examine differences in ED visit rates for youth suicidal ideation and self-harm in rural versus urban areas, and to determine whether mechanisms of injury in youth ED visits for self-harm differ in rural versus urban areas.

METHODS

Study Design and Setting:

We performed a retrospective analysis of ED visits for youth suicidal ideation and/or self-harm from 2016 in the Nationwide Emergency Department Sample (NEDS). The NEDS is part of the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality (AHRQ).[20] The 2016 NEDS is an all-payer database containing 33 million ED visits from 953 hospitals in 37 states, representing a 20% stratified sample of all U.S. hospital EDs. Sampling weights are provided to allow for calculation of estimates representative of all U.S. ED visits nationally. NEDS includes information on patient characteristics (age, sex, insurance payer, quartile of median household income for the patient's zip code, urban-rural classification of the patient's county of residence), *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM) diagnostic codes, and disposition. Race/ethnicity is not available for analysis. This study was deemed exempt from approval by the Lurie Children's Hospital institutional review board.

Study Population:

We defined ED encounters for suicidal ideation and/or self-harm based on the presence of a diagnosis code in any one of the following AHRQ Clinical Classifications Software Revised (CCSR) categories: MBD012 (suicidal ideation/attempt/intentional self-harm), MBD027 (suicide attempt/intentional self-harm; subsequent encounter), or EXT021 (external cause codes: intent of injury, self-harm).[21] Among visits for suicidal ideation and/or self-harm, we used diagnosis code groups from the Child and Adolescent Mental Health Disorders Classification System (CAMHD-CS) to determine the prevalence of mental health comorbidities.[22] Among visits for suicidal ideation and/or self-harm, we used diagnosis codes from the National Center for Health Statistics (NCHS) ICD-10-CM external cause-of-injury matrix to define a subset of these visits for intentional self-harm and classify the injury mechanism in pre-specified categories.[23,24] We further subcategorized visits for poisoning by selected medication classes using diagnosis codes. We included visits for ages 5–19 to allow for alignment with U.S. Census age categories.[25] We excluded 9 visits that were missing age; no visits had missing sex or urban-rural classification.

Measurements:

The primary outcome was the number of ED visits for suicidal ideation and/or self-harm per 10,000 youth. Secondary outcomes included ED visit rates for intentional self-harm, stratified by mechanism of injury. The primary independent variable was urban-rural classification of the patient's county of residence based on the NCHS Urban-Rural Classification Scheme.[26] We classified patient residence as large metropolitan (≥1 million residents), medium metropolitan (250,000–999,999 residents), small metropolitan (50,000–249,999 residents), micropolitan (10,000–49,999 residents), and noncore (<10,000 residents). For portions of the analysis, we collapsed the classification to a dichotomous rural/urban measure, with micropolitan and noncore residences considered rural and all metropolitan residences classified as urban.[27] From the U.S. Census Bureau, we obtained intercensal population counts by age, sex, NCHS urban-rural classification, and U.S. Census region (Northeast, South, Midwest, or West).[25,28]

We compared ED visits for suicidal ideation and/or self-harm in rural and urban areas with respect to age (5–9, 10–14, or 15–19), sex, insurance payer (public, private, self pay/other), quartile of median household income for the patient's zip code, hospital urban-rural location, and disposition. Disposition was classified as admission, transfer to a short-term hospital, transfer to another type of facility (including a psychiatric facility), or other.

Data Analysis:

We tabulated ED visit characteristics for suicidal ideation and/or self-harm by urban-rural location of patient residence and tested differences using χ^2 test with Rao-Scott correction for survey data.[29] We used NEDS sampling and discharge weights to produce nationally representative estimates of ED visits for youth suicidal ideation and/or self-harm and standard errors and to determine the frequencies of mental health comorbidities among these visits.[30] We calculated the visit rate per 10,000 youth based on U.S. Census Bureau counts. We calculated incidence rate ratios (IRR) for ED visits by age, sex, Census region, and urban-rural location of patient residence. Confidence intervals (CI) for IRR were derived based on the survey-weighted standard errors for the counts using the delta method.[30] We determined the number and rate of ED visits for self-harm stratified by mechanism, and we calculated IRR to compare these visits by urban-rural location. We calculated population-adjusted ED visit rates by urban-rural location of residence, with adjustment for differences in age, sex, and U.S. Census region by fitting weighted Poisson generalized linear models. Analyses were conducted in the open source R software environment, using the R add on package "Survey."[31–33]

RESULTS

ED visit characteristics for youth suicidal ideation and/or self-harm in rural versus urban areas

In 2016, there were 297,640 ED visits (47.8 ED visits per 10,000 youth) for suicidal ideation and/or self-harm by youth age 5-to-19 years. The median age was 16 (interquartile range 14–17), with 65.9% visits by females and 15.9% visits by youth living in rural areas. Death occurred in the ED in 159 visits (0.05%), and death occurred during hospitalization in 132 visits (0.04%). Among ED visits for suicidal ideation and/or self-harm, 70.2% had a mental health comorbidity based on the presence of a diagnosis code in one of the following groups: 10.3% attention-deficit hyperactivity disorder, 18.5% anxiety disorders, 6.0% bipolar and related disorders, 48.9% depressive disorders, 6.3% disruptive, impulse control, and conduct disorders, 2.6% schizophrenia spectrum and other psychotic disorders, 16.2% substance-related and addictive disorders, and 9.3% trauma and stressor-related disorders. ED visits for suicidal ideation and/or self-harm by youth living in rural areas compared to urban areas were significantly more likely to involve older youth (age 15-to-19 years), public insurance (55.9% vs. 45.6%), lower median household income (lowest quartile: 40.3% vs. 22.9%) and Midwest and Southern U.S. Census regions ($p<0.001$ for each) (Table 1). Visits by rural youth were less likely to result in admission and more likely to result in transfer to another short-term hospital ($p<0.001$).

ED visit rates for youth suicidal ideation and/or self-harm in rural versus urban areas

In 2016, there were 47.8 ED visits for youth suicidal ideation and/or self-harm per 10,000 youth. ED visit rates for suicidal ideation and/or self-harm were higher among youth age 15-to-19 vs. 5-to-9 years (IRR 24.0, 95% CI 19.1, 30.1), higher among females than males (IRR 2.02, 95% CI 1.74, 2.34), and higher in the Midwest than the South (RR 1.49, 95% CI 1.13, 1.96) (Table 2). Across urban-rural categories, the largest number of ED visits for suicidal ideation and/or self-harm (153,433 visits) occurred among youth living in large metropolitan areas and the highest ED visit rate (58.1 visits per 10,000 youth) occurred among youth living in micropolitan areas. The ED visit rate for suicidal ideation and/or self-harm did not significantly differ by urban-rural location of patient residence.

In 2016, there were 106,181 ED visits for self-harm (17.1 visits per 10,000 youth). ED visit rates for self-harm were higher among youth age 15-to-19 vs. 5-to-9 years (IRR 130.8, 95% CI 102.2, 167.4), higher among females than males (IRR 3.24, 95% CI 2.88, 3.65), and higher in the Midwest compared to the South (IRR 1.48, 95% CI 1.18, 1.85). Across urban-rural categories, the largest number of ED visits for self-harm (51,096 visits) occurred among youth living in large metropolitan areas and the highest ED visit rate (22.0 visits per 10,000 youth) occurred among youth living in micropolitan areas. The ED visit rate for self-harm was significantly higher among youth living in small metropolitan areas (IRR 1.43, 95% CI 1.12, 1.82), micropolitan areas (IRR 1.49, 95% CI 1.12, 1.82), and noncore areas (IRR 1.40, 95% CI 1.17, 1.68) compared to youth living in large metropolitan areas.

After population-adjusting for age, sex, and U.S. Census region, there remained no significant differences for ED visit rates for suicidal ideation and/or self-harm among urban-rural categories (Table 3). In the adjusted model, there was no significant difference in ED visit rates for suicidal ideation and/or self-harm by U.S. Census region. The population-adjusted ED visit rate for self-harm was significantly higher for youth living in small metropolitan (adjusted incidence rate ratio [aIRR] 1.39, 95% CI 1.01, 1.90), micropolitan (aIRR 1.46, 95% CI 1.10, 1.93), and noncore areas (aIRR 1.39, 95% CI 1.03, 1.87) compared to large metropolitan areas.

Mechanisms of injury for ED visits by youth for self-harm in rural versus urban areas

The most frequent mechanisms of injury due to self-harm were poisoning (79.2%) and cutting/piercing (13.5%), with self-inflicted firearm injuries accounting for only 0.1% of visits. ED visit rates were higher among youth living in rural than urban areas for self-inflicted firearm injuries (IRR 3.58; 95% CI 1.31, 9.81) and poisoning (IRR 1.31, 95% CI 1.14, 1.51) (Table 4). After population adjustment, ED visit rates remained significantly higher in rural versus urban areas for self-inflicted firearm injuries (aIRR 3.03, 95% CI 1.32, 6.74). Selected ED visit rates for poisoning with intent to self-harm by medication class are presented in Table 5 (online), with higher ED visit rates found among youth living in rural areas for antiallergic/antiemetic drugs and amphetamines, among other medication classes, but no significant difference in visit rates for opiates/opioids.

DISCUSSION

In this nationally representative study of U.S. ED visits, we found no difference in youth ED visit rates for suicidal ideation and/or self-harm by urban-rural location of residence, but when we examined the subset of visits for self-harm, we found higher visit rates in small metropolitan, micropolitan, and noncore areas. These differences in ED visits for self-harm remained significant after adjustment for population demographics. ED visit rates for self-inflicted firearm injuries were higher in rural than in urban areas. Understanding suicide-related healthcare visits by level of urbanization is important, as it may help identify geographic areas of highest risk and focus prevention efforts.

There are limited prior studies that compare rates of suicidal ideation and self-harm in youth between rural and urban settings. Youth are nearly twice as likely to die by suicide in rural compared to urban areas, but prior studies have not examined ED visit rates or differences in self-injury mechanisms with attention to urban and rural location. [2] In a large national sample, the number of ED visits for suicide attempts and ideation among youth doubled between 2007 and 2015.[11] Our finding that nearly 300,000 ED visits occurred nationally among youth for suicidal ideation and self-harm in 2016, with more than one-third of those for self-harm, indicates the scale of this national mental health crisis. As presentations to the ED only reflect cases that are recognized and deemed to require emergent evaluation, the prevalence of youth suicidal ideation and self-harm in the overall population is likely much greater.

Youth ED visits for self-harm could be higher in rural areas for several reasons. Prior literature has described higher injury-related ED visit rates in rural compared to urban areas, although intentional self-injury accounts for only a small proportion of all injuries. [34] Disparities in access to mental health care exist in rural areas, with shortages of mental health providers such as psychiatrists and psychologists leading to unmet mental health needs.[35–37] Moreover, national survey data indicate that mental, behavioral, and developmental disorders are more prevalent among children in rural areas.[38] Because rural families have lower family incomes, they are less likely to have health insurance with adequate mental health benefits.[39] Rural residents travel longer distances to seek care, with transportation problems more frequently reported as a barrier to care.[40,41] Due to the small size of rural communities, rural residents may have greater concerns regarding lack of anonymity when seeking mental health care.[2] Together, these factors may cause rural youth to delay accessing outpatient mental health services until more serious symptoms or crisis develop.

Prior literature has demonstrated regional differences by U.S. Census regions in ED visit rates by youth for all mental health conditions combined, with the highest rates in the Midwest and lowest in the South.[18] Nationally, youth suicide deaths are also highest in the Midwest.[1] We found a similar pattern for unadjusted ED visit rates for suicidal ideation and/or self-harm, which were highest in the Midwest and lowest in the South, however these regional differences were no longer significant in our adjusted model.

In our unadjusted analysis of injury mechanisms, we found higher visit rates for self-inflicted poisoning and firearm injuries by youth in rural than in urban areas, but this relationship remained significant only for self-inflicted firearm injuries after adjusting for population demographics. Rural areas have been disproportionately affected by the opioid epidemic, and opioid misuse is associated with increased risk for suicide.[42,43] However we did not find significantly higher ED visit rates for opioid poisoning with intent to self-harm among youth in rural areas. We found a more than 3-fold higher ED visit rate for self-inflicted firearm injuries in rural areas, which is consistent with prior work demonstrating higher rural hospitalization rates for youth self-inflicted firearm injuries.[19] Youth in rural areas may have increased familiarity with and access to firearms, as rural families are more likely than urban families to own firearms.[4,44] Household firearm ownership has been correlated with higher suicide rates, and safe firearm storage in the home is protective against adolescent firearm suicide attempts.[45–47] However, only one third of firearm-owning households with children store their firearms safely (locked and unloaded), with no difference in storage practices in rural versus urban areas.[44,48] This highlights the importance of lethal means restriction as a strategy to prevent youth suicide and self-harm, particularly in rural areas.

Our findings confirm previously described differences in epidemiology between suicide-related ED visits and suicide deaths. We found that poisoning and cutting/piercing were the most common injury mechanisms among youth ED visits for self-harm.[49] We found that suffocation (such as hanging) and firearms account for a very small percentage of ED visits for self-harm, despite being the top two mechanisms involved in youth suicide death.[50] Suicide attempts via hanging and firearms have higher case-fatality rates, as many youth who attempt suicide via these mechanisms will not survive to be brought to the ED for evaluation.[51] In contrast to youth suicide deaths, which are more common among males, we confirmed that ED visits for suicidal ideation and self-harm are more common among females.[1]

We found several other notable differences between ED visits by youth for suicidal ideation and self-harm in rural versus urban areas. Visits in rural areas were more likely to involve public insurance and lower median household income, which underscores the need for public health insurance plans to incorporate comprehensive mental health benefits as a strategy to reduce rural youth suicides.[39] We found that nearly one-quarter of youth with a rural residence travel to be seen at an ED located in a metropolitan area, which may reflect the limited availability of mental health services in rural areas. After being seen in the ED, a higher proportion of rural youth are transferred to another short-term hospital, which suggests a lack of definitive mental health capacity at the initial ED. Rural EDs may not be as well prepared to care for youth with mental health needs, as few have recommended policies and transfer guidelines in place for the care of children with mental health conditions.[52,53] For rural children requiring admission for mental health conditions, only 20% are hospitalized in rural hospitals, and 30-day readmission rates at these hospitals are higher than for hospitalizations in metropolitan areas, suggesting provision of lower quality care.[54] Telepsychiatry evaluation is an emerging alternative that may enhance access and reduce the need for transfer to metropolitan areas for specialty mental health evaluation.[55]

Our study has several limitations. The primary limitation is that it relies on administrative data, in particular ICD-10-CM codes, which are subject to coding and misclassification errors. Sometimes the intent of an injury cannot be determined by ED personnel, as when the patient does not disclose the intent or when the patient's ability to communicate is impaired by injury or intoxication. In these cases, codes for unintentional or undetermined intent may be assigned instead, and thus we likely underestimated the total number of injuries due to intentional self-harm.[56] ICD-10-CM codes for intentional self-harm do not distinguish between self-harm with suicidal intent (i.e. suicide attempt) and self-harm without intent to die (i.e. non-suicidal self-harm).[24] Also, as some suicide attempts do not result in injury, visits for self-harm described in this study do not encompass all visits for suicide attempts. The degree and extent of the injuries also cannot be determined. Race and ethnicity are not available for study in the NEDS, prohibiting their analysis. Since this study is limited to patients who presented to the ED, it cannot account for youth with suicidal ideation or self-harm who did not come to the ED, who were admitted directly to inpatient care, or who died before being transported to the ED. Finally, as there is no unique patient identifier in the NEDS dataset to allow for tracking of an individual, each unit of analysis in this study is an ED visit and not an individual patient, and we were unable to assess patterns of ED use by individuals over time.

ED visits for suicidal ideation and self-harm by youth represent a critical opportunity for risk assessment and initiation of suicide prevention interventions.[12,16] A meta-analysis of brief suicide prevention interventions delivered in acute care settings demonstrated increased linkage to follow up mental health care and a reduction in subsequent suicide attempts.[57] Components of successful interventions included: (1) brief contacts, such as follow up calls and text messages, (2) care coordination, such as scheduling visits, collaboration to reduce barriers to attendance, and handoffs to the mental health care team, and (3) safety planning interventions, which involve identifying warning signs, coping strategies, available supports, and reducing access to lethal means.[57] The Suicide Prevention Resource Center guide offers concrete steps and sample materials for implementation of these strategies.[58] The Health Services and Resources Administration "Critical Crossroads" toolkit also provides guidance for EDs on best practices for triage, screening, and assessment of youth with suicidal ideation, which are readily adaptable by low-resource EDs such as those in rural settings.[16] Recent data demonstrate higher positivity rates on ED suicide screening questions for youth since the onset of the COVID-19 pandemic, lending particular urgency to this effort.[59] Our findings may help inform resource allocation and areas of focus for ED-based programs to prevent suicide and self-harm.

At the community level, rural areas may require tailored and innovative strategies to reduce youth suicide-related ED visits and suicides. Youth living in rural areas might particularly benefit from suicide prevention efforts that address mental health provider shortages, promote increased treatment accessibility via the phone or web, and enhance youth connectedness through community engagement.[60] Pediatricians can integrate mental health care into primary care, provide education on lethal means restriction such as safe firearm storage, and work with schools and communities to implement preventive interventions.[61,62]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS

U.S.	United States
ED	Emergency department
NEDS	Nationwide Emergency Department Sample
AHRQ	Agency for Healthcare Research and Quality
NCHS	National Center for Health Statistics
ICD-10-CM	International Classification of Diseases, Tenth Edition, Clinical Modification
CAMHD-CS	Child and Adolescent Mental Health Disorders Classification System
CI	Confidence interva

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TABLE 1.

Characteristics of ED Visits for Youth Suicidal Ideation and/or Self-Harm by Urban-Rural Location of Residence

ED Visit Characteristic	ED Visits (%)	Rural[a] (%) N=47,390	Urban[a] (%) N=250,249	P-value (χ^2)
Age				
5–9	8081 (3%)	2.2	2.8	< .001
10–14	89185 (30%)	29.5	30.1	
15–19	200373 (67%)	68.3	67.1	
Sex				
Male	101528 (34%)	34.2	34.1	.938
Female	196066 (66%)	65.8	65.9	
Primary Payer				
Public	140564 (47%)	55.9	45.6	< .001
Private	129135 (43%)	35.7	44.9	
Self-Pay/Other	27621 (9%)	8.4	9.5	
Median Household Income for Patient's Zip Code				
Lowest Quartile	76448 (26%)	40.3	22.9	< .001
Second Quartile	74442 (25%)	42.4	21.7	
Third Quartile	72950 (25%)	13.7	26.5	
Highest Quartile	69480 (24%)	2.0	27.4	
Census Region				
Northeast	53073 (18%)	10.7	19.2	< .001
Midwest	80744 (27%)	41.7	24.4	
South	97861 (33%)	33.9	32.7	
West	65961 (22%)	13.8	23.8	
Hospital Urban-Rural Status				
Metropolitan	257881 (87%)	21.2	99.0	< .001
Non-metropolitan	39758 (13%)	78.8	1.0	
Disposition				
Admission	58523 (20%)	15.1	20.5	< .001

ED Visit Characteristic	ED Visits (%)	Rural[a] (%) N=47,390	Urban[a] (%) N=250,249	P-value (χ^2)
Transfer to Short-term Hospital	29730 (10%)	16.1	8.8	
Transfer to Other Facility, including Psychiatric Facility	91802 (31%)	29.3	31.1	
Other	117584 (40%)	39.5	39.5	

[a]Rural includes micropolitan and noncore areas. Urban includes large, medium, and small metropolitan areas.

TABLE 2.

ED Visits for Youth Suicidal Ideation and/or Self-Harm by Demographics and Urban-Rural Location of Residence

	Visits for Suicidal Ideation and/or Self-Harm			Visits for Self-Harm		
ED Visit Characteristic	**ED Visits[a]**	**Visit Rate[b] per 10,000 Youth**	**Incidence Rate Ratio (95% CI)**	**ED Visits[a]**	**Visit Rate[b] per 10,000 Youth**	**Incidence Rate Ratio (95% CI)**
Total youth age 5–19	297640	47.8	N/A	106181	17.1	N/A
Age						
5–9	8081	4.0	Ref	574	0.3	Ref
10–14	89185	43.2	10.9 (8.5, 14.1)[c]	27876	13.5	48.1 (36.9, 62.7)[c]
15–19	200373	94.7	24.0 (19.1, 30.1)[c]	77731	36.7	130.8 (102.2, 167.4)[c]
Sex						
Male	101528	32.0	Ref	25858	8.1	Ref
Female	196066	64.4	2.02 (1.74, 2.34)[c]	80302	26.4	3.24 (2.88, 3.65)[c]
U.S. Census Region						
Northeast	53073	52.2	1.27 (0.96, 1.70)	13364	13.2	0.84 (0.66, 1.07)
Midwest	80744	61.1	1.49 (1.13, 1.96)[d]	30763	23.3	1.48 (1.18, 1.85)[c]
South	97861	41.0	Ref	37523	15.7	Ref
West	65961	44.1	1.07 (0.81, 1.42)	24530	16.4	1.04 (0.84, 1.29)
Urban-Rural Location of Residence						
Large Metropolitan (≥1 million residents)	153433	44.3	Ref	51096	14.8	Ref
Medium Metropolitan (250,000 – 999,999 residents)	65256	49.2	1.11 (0.85, 1.45)	24264	18.3	1.24 (0.99, 1.55)
Small Metropolitan (50,000–249,999 residents)	30792	54.5	1.23 (0.93, 1.63)	11924	21.1	1.43 (1.12, 1.82)[d]
Micropolitan (10,000–49,999 residents)	30328	58.1	1.31 (1.07, 1.60)[d]	11486	22.0	1.49 (1.25, 1.78)[c]
Noncore (<10,000 residents)	17062	49.1	1.11 (0.90, 1.35)	7195	20.7	1.40 (1.17, 1.68)[c]

[a] Weighted estimates

[b] U.S. Census population subtotals used in rate calculations.

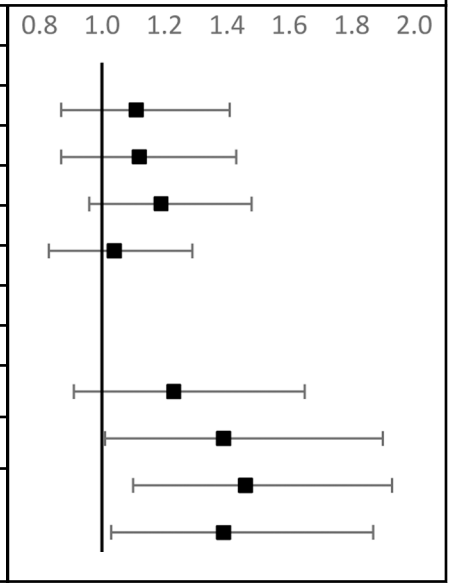
$^{c}P < 0.001$.

$^{d}P < 0.01$.

TABLE 3.

Population-Adjusted Relative ED Visit Rates for Youth Suicidal Ideation and/or Self-Harm by Urban-Rural Location of Residence

ED Visit Type	Adjusted[a] Incidence Rate Ratio (95% CI)
Suicidal Ideation and/or Self-Harm	
Large Metropolitan	Ref
Medium Metropolitan	1.11 (0.87, 1.41)
Small Metropolitan	1.12 (0.87, 1.43)
Micropolitan	1.19 (0.96, 1.48)
Noncore	1.04 (0.83, 1.29)
Self-Harm	
Large Metropolitan	Ref
Medium Metropolitan	1.23 (0.91, 1.65)
Small Metropolitan	1.39 (1.01, 1.90)[b]
Micropolitan	1.46 (1.10, 1.93)[b]
Noncore	1.39 (1.03, 1.87)[b]



[a] Adjusted for age, sex, and U.S. Census Region

[b] $P < 0.05$

TABLE 4.

Youth ED Visits for Self-Harm by Injury Mechanism and Urban-Rural Location of Residence

Mechanism	ED Visits (%)[a]	ED Visit Rate per 100,000 Youth		Incidence Rate Ratio (95% CI)	Adjusted[c] Incidence Rate Ratio (95% CI)
		Urban (95% CI)[b]	Rural (95% CI)[b]		
Cut/Pierce	14341 (13.5%)	22.40 (19.60, 25.20)	27.06 (22.53, 31.58)	1.21 (0.98, 1.49)	1.20 (1.00, 1.43)
Firearm	74 (0.1%)	0.09 (0.04, 0.14)	0.31 (0.06, 0.57)	3.58 (1.31, 9.81)[e]	3.03 (1.32, 6.74)[e]
Poisoning	84083 (79.2%)	129.47 (117.23, 141.7)	170.22 (152.93, 187.52)	1.31 (1.14, 1.51)[f]	1.28 (0.99, 1.66)
Suffocation	1019 (1.0%)	1.59 (1.29, 1.89)	1.93 (1.14, 2.71)	1.21 (0.77, 1.90)	1.23 (0.72, 2.02)
Other[d]	21653 (20.4%)	3.273 (2.925, 3.621)	4.761 (4.109, 5.412)	1.45 (1.22, 1.73)[f]	1.37 (0.98, 1.90)
All Mechanisms	106181 (100%)	163.52 (148.29, 178.75)	214.76 (194.04, 235.49)	1.31 (1.15, 1.50)[f]	1.27 (0.96, 1.68)

[a] Percentage among ED visits for self-harm. Percentages add to greater than 100% because visits could involve more than one mechanism.

[b] Urban includes large, medium, and small metropolitan areas. Rural includes micropolitan and noncore areas.

[c] Adjusted for age, sex, U.S. Census region.

[d] Other includes: Drowning/Submersion, Fire/Burn, Fall, All Transportation, Natural Environment, Struck by/against, Other Specified, Unspecified.

[e] P<0.01

[f] P<0.001