Letters

RESEARCH LETTER

Trends in Emergency Department Visits for Nonfatal Self-inflicted Injuries Among Youth Aged 10 to 24 Years in the United States, 2001-2015

In the United States, youth have the highest burden of nonfatal self-inflicted injury (ie, deliberate physical harm against oneself, inclusive of suicidal and nonsuicidal intent) requiring medical attention.[1] One study found that emergency department (ED) visits for these injuries during the 1993 to 2008 period varied by age group, ranging from 1.1 to 9.6 per 1000 ED visits, with adolescents aged 15 to 19 years exhibiting the highest rates.[1] Self-inflicted injury is one of the strongest risk factors for suicide—the second-leading cause of death among those aged 10 to 24 years during 2015.[2] This study examined trends in nonfatal self-inflicted injuries treated in hospital EDs among US children, adolescents, and young adults aged 10 to 24 years (hereafter referred to as youth).

Methods | The National Electronic Injury Surveillance System—All Injury Program (NEISS-AIP) collects data on all first-time visits for nonfatal injuries treated in 66 US hospital EDs through stratified probability sampling, allowing for the derivation of national estimates.[3] Self-inflicted injuries were identified by reviewing injury cause narratives and other coded data within ED records. This study used publicly available secondary data and was exempted by the CDC from institutional review board review.

Self-inflicted injury ED visit rates were calculated from 2001 through 2015 by sex, age (10-14, 15-19, and 20-24 years), along with injury method (poisoning, sharp object, blunt object), and 95% CIs using US Census population estimates as denominators. Rates were weighted to obtain nationally representative estimates and age-adjusted to the 2000 US Census population. Trends in self-inflicted injury ED visit rates were assessed using joinpoint regression software (Surveillance Research Program, National Cancer Institute), version 4.3.1.0. The annual percentage change described the rate of change for each linear segment.

Results | From 2001 to 2015, NEISS-AIP captured 43 138 youth self-inflicted injury ED visits. The overall weighted age-adjusted rate for this group showed no statistically significant trend until 2008, increasing 5.7% (95% CI, 3.0%-8.4%) annually thereafter and reaching 303.7 per 100 000 population (95% CI, 254.1-353.3) in 2015 (**Table**). Age-adjusted trends for males overall and across age groups remained stable throughout 2001-2015 (**Figure**, Table). Overall age-adjusted rates for females demonstrated no statistically significant trend before 2009, yet increased 8.4% (95% CI, 5.6%-11.2%) yearly from 2009 to 2015. After 2009, rates among females aged 10 to 14 years increased 18.8% (95% CI, 12.1%-25.8%) per year—from 109.8 (95% CI, 69.9-149.7) in 2009 to 317.7 (95% CI, 230.3-405.1) per 100 000 population in 2015. Rates among females aged 15 to 19 years showed a 7.2% (95% CI, 3.8%-10.8%) increase per year during 2008-2015. Rates among females aged 20 to 24 years exhibited a 2.0% (95% CI, 0.8%-3.1%) increase per year throughout 2001-2015 (Figure, Table).

Trends for all self-inflicted injury methods were stable for males. Poisoning was the most common method of self-inflicted injury for females, with rates remaining stable until 2007 and increasing 5.3% (95% CI, 0.5%-10.4%) annually thereafter. Female rates for self-inflicted injuries by sharp object increased 7.1% (95% CI, 5.2%-8.9%) annually throughout 2001-2015; female rates for blunt object injuries were stable during 2006-2015 (Table).

Discussion | Youth self-inflicted injury ED visit rates were relatively stable before 2008. However, rates among females significantly increased thereafter—particularly among females aged 10 to 14 years, who experienced an 18.8% annual increase from 2009 to 2015. This study only included ED cases; thus, rates were underestimated. Also, limited statistical power could have resulted in some trends not showing statistical significance. Findings are consistent with previously reported upward trends in youth suicide rates during 1999-2014, in which rates increased most notably after 2006 with females aged 10 to 14 years experiencing the greatest increase.[4] Findings also coincide with increased reports of depression among youth, especially young girls.[5] Other potential underlying reasons for the observed increasing trends, particularly among young females, warrant further study.

These findings underscore the need for the implementation of evidence-based, comprehensive suicide and self-harm prevention strategies within health systems and communities. These strategies include strengthening access to and delivery of care for suicidal youth within health systems and creating protective environments, promoting youth connectedness, teaching coping and problem-solving skills, and identifying and supporting at-risk youth within communities.[6]

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Author Contributions: Dr Mercado had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Table. Trends in Nonfatal Self-inflicted Injury Emergency Department (ED) Visit Rates (per 100 000) Among Youth Aged 10 to 24 Years in the United States, 2001-2015[a]

	2001		2015		Segment 1[a]		Segment 2[a]		Segment 3[a]	
	Unweighted Nonfatal Self-inflicted Injury ED Visits, No.	Weighted Rate (95% CI)	Unweighted Nonfatal Self-inflicted Injury ED Visits, No.	Weighted Rate (95% CI)	Period	APC (95% CI)	Period	APC (95% CI)	Period	APC (95% CI)
Male										
Age group, y										
10-14	93	33.9 (21.4 to 46.4)	180	44.1 (22.9 to 65.3)	2001 to 2015	1.0 (−2.0 to 4.1)				
15-19	387	213.7 (150.4 to 277.0)	531	256.5 (176.9 to 336.1)	2001 to 2015	0.5 (−0.9 to 1.8)				
20-24	350	240.7 (165.6 to 315.8)	407	243.8 (181.7 to 305.9)	2001 to 2015	−0.1 (−1.3 to 1.2)				
Injury type[b]										
Poisoning	460	89.5 (69.9 to 109.1)	359	74.1 (55.2 to 93.0)	2001 to 2008	−6.3 (−10.4 to −2.1)	2008 to 2011	10.6 (−19.4 to 51.9)	2011 to 2015	−4.3 (−14.0 to 6.4)
Sharp object	228	45.2 (33.4 to 57.1)	347	50.7 (38.5 to 62.8)	2001 to 2015	1.1 (−0.3 to 2.5)				
Blunt object	35	6.0 (3.1 to 8.9)	101	11.8 (7.3 to 16.3)	2001 to 2015	1.3 (−2.5 to 5.2)				
Overall trend	830	160.8 (114.9 to 206.7)	1118	184.3 (135.1 to 233.5)	2001 to 2015	0.5 (−0.5 to 1.6)				
Age-adjusted overall trend	830	160.2 (127.9 to 192.5)	1118	179.2 (144.9 to 213.5)	2001 to 2015	0.3 (−0.7 to 1.4)				
Female										
Age group, y										
10-14	286	119.4 (78.4 to 160.4)	1033	317.7 (230.3 to 405.1)	2001 to 2004	9.7 (−8.1 to 30.9)	2004 to 2009	−4.3 (−13.1 to 5.4)	2009 to 2015	18.8 (12.1 to 25.8)
15-19	725	389.3 (271.7 to 506.9)	1356	632.5 (465.9 to 799.1)	2001 to 2004	11.0 (−2.8 to 26.7)	2004 to 2008	−4.6 (−14.1 to 5.9)	2008 to 2015	7.2 (3.8 to 10.8)
20-24	355	228.0 (150.4 to 305.6)	556	346.2 (253.1 to 439.3)	2001 to 2015	2.0 (0.8 to 3.1)				
Injury type[b]										
Poisoning	988	170.9 (135.0 to 206.8)	987	203.3 (167.1 to 239.5)	2001 to 2007	−6.4 (−13.0 to 0.8)	2007 to 2015	5.3 (0.5 to 10.4)		
Sharp object	261	54.1 (40.5 to 67.7)	1021	136.3 (103.5 to 169.0)	2001 to 2015	7.1 (5.2 to 8.9)				
Blunt object	19	2.5 (0.5 to 4.5)	104	11.2 (7.3 to 15.0)	2001 to 2006	36.1 (15.7 to 60.0)	2006 to 2015	−0.7 (−4.9 to 3.6)		
Overall trend	1366	244.3 (171.8 to 316.8)	2945	430.8 (325.5 to 536.1)	2001 to 2004	9.1 (0.2 to 18.8)	2004 to 2009	−1.6 (−5.7 to 2.8)	2009 to 2015	7.9 (5.0 to 10.8)
Age-adjusted overall trend	1366	245.5 (196.5 to 294.5)	2945	434.0 (363.2 to 504.8)	2001 to 2004	9.0 (0 to 18.8)	2004 to 2009	−1.9 (−6.2 to 2.5)	2009 to 2015	8.4 (5.6 to 11.2)
Overall										
Age-adjusted overall trend		**201.6 (163.8 to 239.4)**		**303.7 (254.1 to 353.3)**	**2001 to 2004**	**7.9 (−2.4 to 19.4)**	**2004 to 2008**	**−3.7 (−11.0 to 4.1)**	**2008 to 2015**	**5.7 (3.0 to 8.4)**

Abbreviation: APC, annual percentage change.

[a] Joinpoint regression was used to determine nonfatal self-inflicted injury emergency department visit rate trends overall and by sex or age-group. Trends are presented as linear segments connected at the joinpoints (ie, at the years when the slope of each trend changed significantly). The number and location of joinpoints for each trend is determined statistically. Therefore, the periods for each linear segment within each trend may vary. If no joinpoint was identified for a trend, then that trend remained linear for the entire 2001-2015 period; in those instances, the APC is presented in Segment 1 only and left blank for all other segments.

[b] Insufficient sample size to analyze the trends for other types of self-inflicted injury. Blunt object–related injuries include "Injuries resulting from being struck by (hit) or crushed by a human, animal, or inanimate object or force other than a vehicle or machinery." This does not include falls from heights, such as buildings and bridges.

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Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the CDC.

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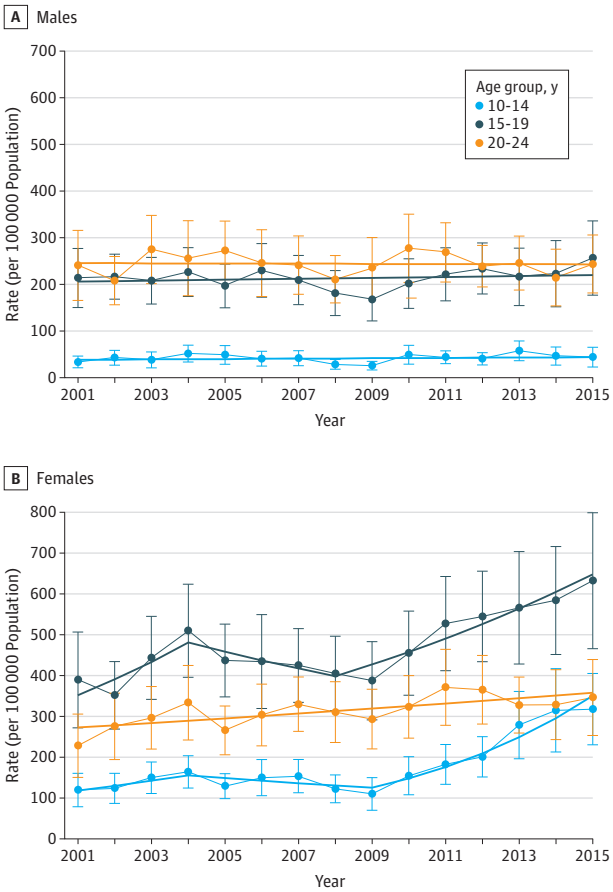
Figure. Nonfatal Self-Inflicted Injury Emergency Department Visits Among Youth Aged 10 to 24 Years in the United States, 2001-2015



Data markers indicate observed rates and solid colored lines indicate modeled rates. The error bars represent the 95% CIs of the observed rates. A, No significant trends for annual percentage change by age group were noted for males. B, Among females, the significant trends for annual percentage change by age group were 2009 to 2015 (18.8 [95% CI, 12.1-25.8]) for 10 to 14 years, 2008 to 2015 (7.2 [95% CI, 3.8-10.8]) for 15 to 19 years, and 2001 to 2015 (2.0 [95% CI, 0.8-3.1]) for 20 to 24 years.

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COMMENT & RESPONSE

Consequences of Reductions in Hospital Readmissions

To the Editor The Patient Protection and Affordable Care Act established the Hospital Readmissions Reduction Program (HRRP) with public reporting of 30-day risk-standardized readmission rates and financial penalties for hospitals with higher-than-expected readmissions. Concerns have been raised regarding unintended consequences, particularly for patients with heart failure (HF).[1,2] Incentives to reduce readmissions may perversely encourage inappropriate care strategies, such as discouraging appropriate triage for emergency care.[1,2] The financial penalties have been shown to fall disproportionately on academic medical centers and safety-net hospitals, which provide care disproportionately for patients with lower socioeconomic status and minorities. These penalties may hinder the ability of these hospitals to provide care for these vulnerable populations, potentially resulting in unintended consequences.[2]

The analysis of fee-for-service Medicare beneficiaries hospitalized with HF along with other conditions covered by the HRRP from 2008 to 2014 by Dr Dharmarajan and colleagues found that reductions in paired monthly hospital 30-day readmissions were weakly but statistically significantly correlated with reductions in 30-day mortality rates after discharge. This finding could indicate that 30-day postdischarge mortality was not increased by efforts to reduce rehospitalizations.[3] However, the assessment for unintended consequences needs to consider the effect on all patients and all hospitals exposed, not just those from hospitals with declining readmissions. During the course of the study, after HRRP implementation, 30-day risk-adjusted postdischarge mortality in Medicare beneficiaries hospitalized with HF increased from 7.9% in 2008 to 9.2% in 2014, a 1.3% absolute increase and 16.5% relative increase. In 2014, because 385 222 Medicare beneficiaries were hospitalized with HF, a 1.3% absolute increase in mortality would represent a considerable number of excess HF patient deaths associated with HRRP implementation. Furthermore, in the decade prior to HRRP, 30-day risk-adjusted mortality rates in patients with HF had steadily declined by 16.4%,[4] so the magnitude of this potential adverse consequence might be considerably greater.

Rather than providing any measure of reassurance, we believe the question of harm remains. These findings suggest that the HRRP policies targeting readmissions after HF hospitalization may have been associated with the serious unintended consequence of higher mortality. If confirmed, these data represent the worst-case scenario regarding the potential effect of HRRP. Consideration needs to be given to more rigorous assessment of this question, and if proven to be harmful, action to mitigate those components that may have contributed to the increase in HF mortality should be implemented.

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