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# Prevalence of Depression Among Adolescents in the U.S. From 2009 to 2019: Analysis of Trends by Sex, Race/Ethnicity, and Income

Michael Daly, Ph.D. \*

Department of Psychology, Maynooth University, Co. Kildare, Ireland

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## A B S T R A C T

**Purpose:** Major depression is a leading cause of disability and represents a significant health concern for adolescents. Evidence of temporal trends in adolescent depression stratified by sociodemographic characteristics is needed.

**Methods:** This study drew on 11 years of the National Survey on Drug Use and Health (N = 167,783), a nationally representative survey of adolescents aged 12–17 years conducted between 2009 and 2019.

**Results:** The prevalence of past-year major depressive episode (MDE) increased by 7.7 percentage points from 8.1% to 15.8% between 2009 and 2019. MDE increased by 12 percentage points from 11.4% to 23.4% among girls. The gender difference in the prevalence of MDE increased from 6.4% to 14.8% between 2009 and 2019. Black participants experienced a comparatively small increase in depression (4.1%).

**Conclusions:** Since 2009 there has been a sharp and sustained increase in depression among adolescent girls in the U.S. This concerning trend highlights the critical importance of directing prevention and intervention efforts toward this group.

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**IMPLICATIONS AND CONTRIBUTION**

This study provides nationally representative evidence that the prevalence of major depressive episode doubled among adolescent girls over an 11-year period from 2009 to 2019. Identifying the causes of this increase and enhancing mental health promotion, prevention, and intervention efforts targeting adolescent girls will now be crucial.

Depression is a leading cause of impairment and disability globally [1] and major contributor to suicidal behavior [2]. The prevalence of fatal suicide among U.S. adolescents and young adults increased by 57.4% between 2007 and 2018 [3]. This trend has been attributed to a range of potential causes including increased prevalence of anxiety and depressive disorders over this period [4]. Of particular concern is a rise in the prevalence of major

depression reported by U.S. adolescents since 2010 [5,6]. Although national trends in depression have been documented, reliable up-to-date estimates of trends among key subpopulations are needed. To address this gap, this study drew on nationally representative data to estimate temporal trends in the prevalence of past-year major depressive episode (MDE) across sex, race/ethnicity, and household income groups between 2009 and 2019.

**Conflicts of interest:** No conflicts of interest reported.

**Data Availability:** The data that support the study findings can be accessed from the Substance Abuse and Mental Health Data Archive (<https://www.datafiles.samhsa.gov/>).

\* Address correspondence to: Michael Daly, Ph.D., Department of Psychology, Maynooth University, 1.1.7 Education House, Maynooth, Ireland.

E-mail address: [Michael.A.Daly@mu.ie](mailto:Michael.A.Daly@mu.ie).

**Methods**
*Study population*

Participants were 167,783 adolescents aged 12–17 years who took part in the 2009–2019 waves of the National Survey on

Drug Use and Health (NSDUH), administered using computer-assisted interviewing methods [7]. The NSDUH is an annual cross-sectional survey of the U.S. population with a high response rate ( $\geq 70\%$  for those aged 12–17 across the years examined) [7]. Each year the NSDUH utilizes a stratified, multi-stage area probability sampling method to select participants and provide nationally representative estimates for noninstitutionalized individuals aged 12 and older [8]. This study involved secondary analysis of anonymized microdata files and did not require institutional approval from the Maynooth University Social Research Ethics Sub-Committee.

### Past-year depression

The presence of MDE in the past year was assessed using a structured interview based on DSM-5 criteria and adapted from the depression module of the National Comorbidity Survey-Adolescent which used modified version of the World Health Organization Composite International Diagnostic Interview [7,9,10]. Past-year MDE was defined as present when a participant reported  $\geq 5$  of nine symptom criteria for MDE (e.g., problems with sleeping, eating, fatigue/loss of energy, feelings of worthlessness, recurrent thoughts of death or suicidal ideation) in the same 2-week period in the past year, where  $\geq 1$  of the criteria was either depressed mood or loss of interest or pleasure in daily activities during this period [7].

### Demographics

Participants reported their age in years (coded as 12–14, 15–17), sex (male, female), and race/ethnicity (categorized as non-Hispanic white, non-Hispanic black, Hispanic, and other race/ethnicity). Household income was classified as either less than \$50,000 per annum or greater than or equal to \$50,000 per annum.

### Statistical analysis

Logistic regression analysis with cluster robust standard errors followed by the Stata margins postestimation command was used to estimate percentage-point differences in the prevalence

of MDE between 2009 and 2019, with statistical significance defined as two-sided,  $p < .05$ . Interactions between survey year and demographic characteristics were tested to identify whether changes in the prevalence of MDE from 2009 to 2019 differed as a function of participant sex, race/ethnicity, household income, and age groups. All analyses incorporated sampling weights taking into account the NSDUH's complex survey sampling design to generate nationally representative estimates.

### Results

In the NSDUH, the prevalence of MDE increased significantly from 8.1% (95% confidence interval [CI] 7.5–8.7) in 2009 to 15.8% (95% CI 15.2–16.5) in 2019, an increase of 7.7 percentage points (95% CI 6.8–8.6) (Table 1, Figure 1A). Depression levels increased by 3.2 percentage points (95% CI 2.3–4.1) from 2009 to 2014 and by 4.5 percentage points (95% CI 3.5–5.5) from 2014 to 2019.

Statistically significant increases in the prevalence of MDE were observed across all demographic groups examined (Table 1). Depression levels among female participants increased by 12 percentage points (95% CI 10.4–13.5) between 2009 and 2019, from 11.4% to 23.4%. This increase was 8.3 percentage points (95% CI 6.2–10.4) larger than the increase experienced by males over the same period (3.7%, 95% CI 2.5–4.8) (Figure 1B). The gender difference in adolescent depression levels increased from 6.4 percentage points (95% CI 5.4–7.5) in 2009 to 14.8 percentage points (95% CI 12.9–16.6) in 2019. Both males and females experienced statistically significant increases in depression from 2009 to 2019 across all age, race/ethnicity, and income groups examined, as shown in Table S1. Female participants experienced a significantly larger increase in depression than male participants in each age, income, and race/ethnicity group except for black participants where the change in depression did not differ significantly between males and females (Table S1).

Black participants experienced a 4.1 percentage point (95% CI 1.7–6.5) increase in the prevalence of MDE which was smaller than the increase experienced by white (–3.3% lower increase, 95% CI –6.1 to –.6), Hispanic (–5.6%, 95% CI –9.1 to –2.1), and other race/ethnicity participants (–5.1%, 95% CI –9.4 to –.7). Depression trends for black and white/Hispanic/other race/

**Table 1**

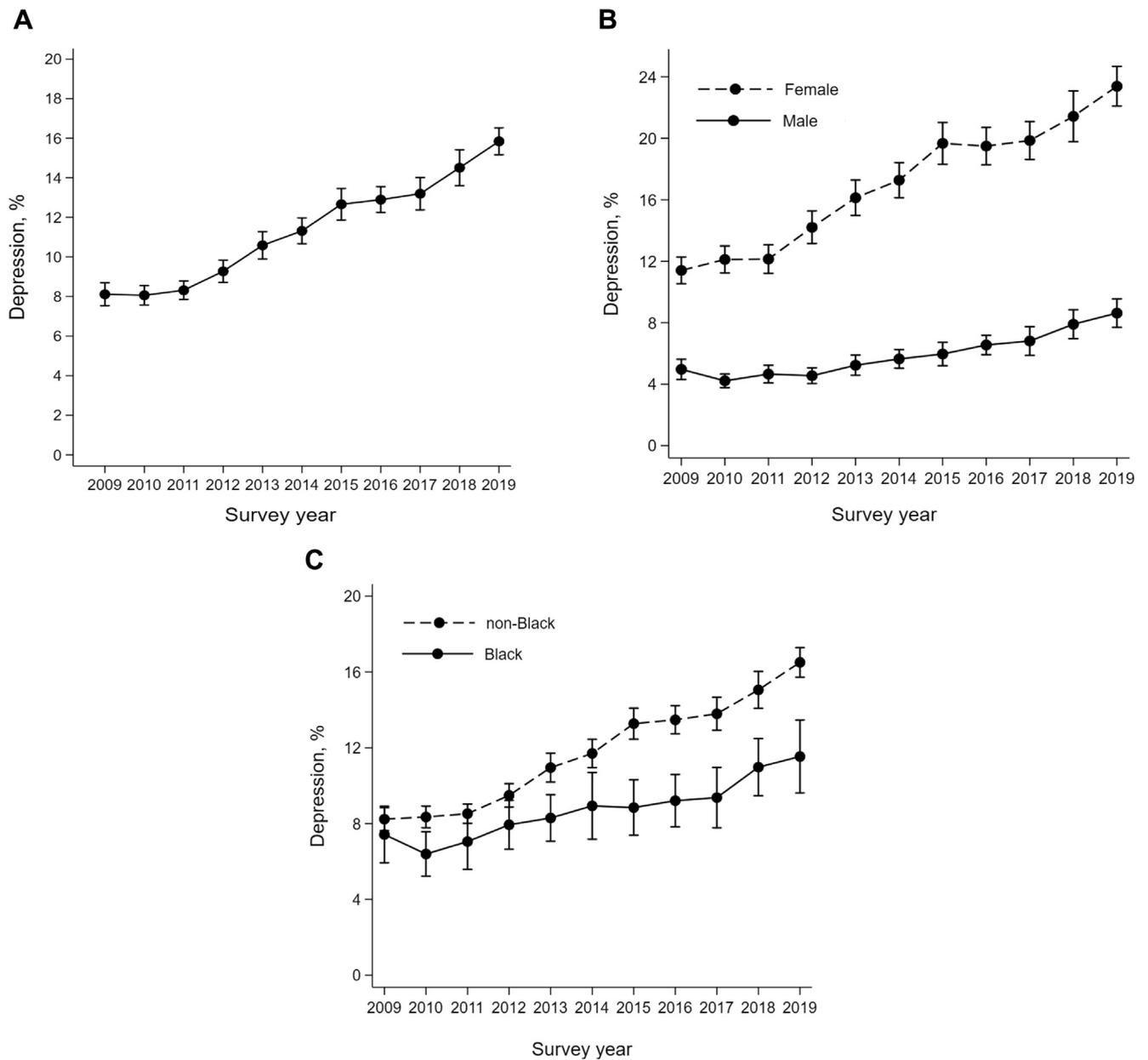
Estimated changes in the prevalence of past-year MDE among U.S. adolescents from 2009 to 2019 by sociodemographic characteristics

Demographic characteristic	2009 survey wave (N = 17,162)		2019 survey wave (N = 12,950)		Change in depression % (95% CI) <sup>d</sup>	Percentage increase <sup>b</sup>
	% of sample	Depression % (95% CI) <sup>a</sup>	% of sample	Depression % (95% CI) <sup>a</sup>		
Overall sample	—	8.1 (7.5–8.7)	—	15.8 (15.2–16.5)	7.7 (6.8–8.6)	95.1%
Age 12–14	46.8	5.4 (4.7–6.2)	49.6	12.2 (11.2–13.3)	6.8 (5.5–8.0)	126.0%
Age 15–17	53.2	10.5 (9.5–11.4)	50.4	19.4 (18.1–20.7)	8.9 (7.4–10.5)	84.8%
Male	51.2	5.0 (4.3–5.6)	51.1	8.6 (7.6–9.6)	3.7 (2.5–4.8)	74.0%
Female	48.8	11.4 (10.5–12.3)	48.9	23.4 (22.1–24.7)	12.0 (10.4–13.5)	105.3%
White	58.6	8.3 (7.6–9.0)	51.7	15.8 (14.8–16.7)	7.5 (6.3–8.7)	90.4%
Hispanic	19.5	8.1 (6.5–9.8)	24.8	17.8 (16.0–19.6)	9.7 (7.3–12.1)	119.8%
Black	15.0	7.4 (5.9–8.9)	13.4	11.5 (9.6–13.5)	4.1 (1.7–6.5)	55.4%
Other race/ethnicity <sup>c</sup>	7.0	7.9 (5.9–9.9)	10.1	17.1 (14.3–19.8)	9.2 (5.8–12.6)	116.5%
Income <\$50,000	46.4	8.0 (7.1–9.0)	40.0	15.5 (14.2–16.8)	7.5 (5.9–9.1)	93.8%
Income $\geq$ \$50,000	53.6	8.2 (7.5–8.9)	60.0	16.0 (15.1–17.0)	7.9 (6.7–9.1)	96.3%

<sup>a</sup> Estimates are from marginal effects calculated after logistic regression with cluster robust standard errors. All estimates of change in depression are statistically significant at the  $p < .001$  level.

<sup>b</sup> Percentage change in depression levels relative to 2009 levels defined as: [Percentage point change in depression from 2009 to 2019  $\times$  100]/[Percentage with depression in 2009].

<sup>c</sup> Race/ethnicity was self-reported. The other race/ethnicity group includes Asian, American Indian/Alaska Native, Native Hawaiian and Other Pacific Island, and other non-Hispanic multiracial groups which were combined due to small group sizes.



**Figure 1.** Trends in the prevalence of past-year MDE from 2009 to 2019 in the (A) overall NSDUH sample, for (B) males and females, and (C) nonblack and black race/ethnicity groups. Note: NSDUH graphs are derived from logistic regression analysis of 167,783 participants. 95% confidence intervals are presented.

ethnicity participants is shown in [Figure 1C](#). The magnitude of the increase in the prevalence of MDE between 2009 and 2019 did not differ significantly by household income or participant age.

## Discussion

This study of over 160,000 adolescents aged 12–17 years drew on nationally representative data to show that the prevalence of MDE approximately doubled between 2009 and 2019 (from 8.1% to 15.8%). This prolonged rise in MDE is concerning because adolescent depression tends to persist into adulthood

[11] and forecasts adverse health and socioeconomic consequences throughout life [9,12].

In the current study, the gender disparity in depression more than doubled (from 6.4 to 14.8 percentage points) between 2009 and 2019 driven by a substantial rise in the prevalence of MDE among females over this period. This finding extends existing evidence that has found significant though less pronounced increases in internalizing problems [13,14] and depressive symptoms [15] among adolescent girls since the beginning of the 21st century. Potential reasons for this increase are manifold and include increases in bullying and victimization [16] and use of social media and technology [17] which may have been more impactful for girls than boys. In addition, reduced sleep quality

and quantity [18], the long-term impact of the Great Recession, and rising educational expectations [19] may have contributed to the rise in depression.

The current study is limited in its reliance on self-reports of depressive symptoms that may differ from clinical evaluations and could be subject to recall bias. This study utilized repeated cross-sectional data and it remains possible that the surveyed populations differed over time, though the NSDUH's high response rate, consistent sampling design, and use of survey weights safeguards against this possibility.

The results highlight the need for further investment in adolescent mental health promotion, mental health services, and intervention programs. School group-based interventions, exercise, and psychological therapy have demonstrated effectiveness in reducing adolescent depressive symptoms [20] and could help tackle the marked rise in depression among adolescent girls identified in this study.

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### Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2021.08.026>.

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