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Trends in depression prevalence in the USA from 2005 to 2015: widening disparities in vulnerable groups

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Abstract

Background. Major depression is associated with significant disability, morbidity, and mortality. The current study estimated trends in the prevalence of major depression in the US population from 2005 to 2015 overall and by demographic subgroups.

Methods. Data were drawn from the National Survey on Drug Use and Health (NSDUH), an annual cross-sectional study of US persons ages 12 and over (total analytic sample $N = 607\,520$). Past-year depression prevalence was examined annually among respondents from 2005 to 2015. Time trends in depression prevalence stratified by survey year were tested using logistic regression. Data were re-analyzed stratified by age, gender, race/ethnicity, income, and education.

Results. Depression prevalence increased significantly in the USA from 2005 to 2015, before and after controlling for demographics. Increases in depression were significant for the youngest and oldest age groups, men, and women, Non-Hispanic White persons, the lowest income group, and the highest education and income groups. A significant year × demographic interaction was found for age. The rate of increase in depression was significantly more rapid among youth relative to all older age groups.

Conclusions. The prevalence of depression increased significantly in the USA from 2005 to 2015. The rate of increase in depression among youth was significantly more rapid relative to older groups. Further research into understanding the macro level, micro level, and individual factors that are contributing to the increase in depression, including factors specific to demographic subgroups, would help to direct public health prevention and intervention efforts.

Introduction

Major depression has serious and significant consequences for millions of people in the USA and around the world. At least one in five US adults experience depression in their lifetime and the past-year prevalence of depression is approximately 6% (Hasin *et al.* 2005). Depression is associated with substantial individual suffering; occupational, social, and family role impairment; and is a leading cause of disability and mortality (Lopez & Mathers, 2006; Saint Onge *et al.* 2014; WHO, 2016). By the year 2030, it is estimated that depression will be the leading cause of illness globally, after HIV/AIDS (Mathers & Loncar, 2006). Depression is also the single strongest risk factor for suicide behavior (Hasin *et al.* 2005; Chang *et al.* 2013; WHO, 2016), which has increased over time (Case & Deaton, 2015; Rockett *et al.* 2016). While there has been substantial progress in both psychopharmacologic and psychotherapeutic treatments for depression (Shim *et al.* 2011), most individuals with depression remain untreated or experience extensive delays between the onset of depression and treatment (Riolo *et al.* 2005; Shim *et al.* 2011; Whiteford *et al.* 2013). Because depression impacts a significant percentage of the US population and has serious individual and societal consequences, it is important to understand whether and how the prevalence of depression has changed over time in the USA so that decisions about funding and strategies for public health efforts can be based on current population needs.

There has been a long-standing interest in estimating whether secular changes in depression and other disorders have occurred (e.g. Häfner, 1985). Several studies have reported increases in depression prevalence over time (e.g. Compton *et al.* 2006; Hidaka, 2012).

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Building on this work by continuing to address this question with recent data is needed in order to identify trends in depression that can inform current public health efforts.

Further, prior cross-sectional epidemiologic studies have repeatedly identified substantial disparities in depression prevalence by demographic subgroups (e.g. gender, income, education). Yet, little data on trends in depression by these subgroups have been available. Younger and older adults report lower prevalences of depression than middle age groups (Pratt & Brody, 2014). With regard to race/ethnicity, people who identify as non-Hispanic White report a higher prevalence of depression than persons from other racial/ethnic groups with the exception of Native American persons (Hasin *et al.* 2005; Williams *et al.* 2007). Compared with non-Hispanic Black persons, non-Hispanic White persons exhibit stronger relationships between depression symptoms and a subsequent diagnosis of major depressive disorder (Moazen-Zadeh & Assari, 2016), depression and hopelessness (Assari *et al.* 2016), and depression and mortality (Assari *et al.* 2016). In terms of gender, it has been well-established that more women than men report depression (e.g. Hasin *et al.* 2005, Van de Velde *et al.* 2010, Pratt & Brody, 2014, Kuehner, 2017). Finally, indicators of lower socioeconomic status (SES) are associated with higher prevalences of depression (Everson *et al.* 2002; Lorant *et al.* 2003; Pratt & Brody, 2014; Hasin & Grant, 2015) and greater odds of chronic depression (Rubio *et al.* 2011). To our knowledge, there is no currently available information estimating trends in depression among demographic subgroups in the USA over the past decade. If depression is found to be increasing overall, or increasing to a greater degree among specific demographic subgroups, this information can help identify populations most in need of public health and outreach efforts.

The purpose of the current study was to examine changes in the prevalence of depression in the USA over an 11-year period. First, the study estimated trends in the prevalence of depression among US individuals, ages 12 and older from 2005 to 2015. Second, the study estimated trends in the prevalence of depression from 2005 to 2015 by demographic characteristics (i.e. age, race/ethnicity, gender, income, education).

Methods

Study population

Study data were drawn from the National Survey on Drug Use and Health (NSDUH) public data portal (http://www.icpsr.umich.edu/). The NSDUH provides annual cross-sectional national data on tobacco use, other substance use, and mental health in the USA and is described in depth elsewhere (SAMHSA, 2015). A multistage area probability sample for each of the 50 states and the District of Columbia was conducted to represent the male and female civilian non-institutionalized population of the USA aged 12 and older. The datasets from each year included in the current analyses (2005–2015) were concatenated, adding a variable for the survey year. Person-level analysis sampling weight for the NSDUH was computed to control for individual-level non-response, and were adjusted to ensure consistency with population estimates obtained from the US Census Bureau. In order to use the 11 years of combined data, a new weight was created upon aggregating the 11 datasets by dividing the original weight by the number of datasets combined. Further descriptions of the sampling methods and survey techniques for the NSDUH are found elsewhere (SAMHSA, 2015). For this study, analyses were restricted to participants who responded to questions about past-year depression at the time of the interview resulting in a total analytic sample of $N = 607\,520$.

Measures

Past-year depression

Questions to assess major depressive episode (MDE) were based on DSM-IV criteria (American Psychological Association, 1994) and adapted from the depression section of the National Comorbidity Survey-Replication (Hedden *et al.* 2012) for adults and from the National Comorbidity Survey-Adolescent for youth. Separate depression modules were administrated to adults (18 years old or older) and to youth (12–17 years old). Participants were classified as having had a lifetime MDE based on the report of having five or more out of nine symptoms for MDE, including either depressed mood or loss of interest or pleasure in daily activities, during the same 2-week period in their lifetime. Respondents with lifetime MDE were further classified as having past-year MDE if they met criteria for a lifetime MDE and reported feeling depressed or lost interest or pleasure in daily activities, as well as other symptoms, for at least 2 weeks during the past 12 months. Due to changes in the questionnaire in 2008, adjusted past-year MDE variables for adults were developed to allow for comparison between the years 2005 and 2008 and the later years. The past-year MDE variable for this study was created by combining the youth and adult variables.

Demographics

Demographic variables were categorized as follows: age (12–17 years old as reference group, 18–25 years old, 26–34 years old, 35–49 years old, 50 years or older), race/ethnicity (collapsed from seven to four categories: non-Hispanic White as reference group, non-Hispanic Black, Hispanic, and Other), gender (male as reference group, female), total annual family income (less than $20 000 per year as reference group, $20 000 to $49 999 per year, $50 000 to $74 999 per year and greater than $75 000 per year), education (less than high school as reference group, high school graduate, some college, college graduate), and marital status (collapsed from four to three categories: married as reference group, widowed, separated or divorced, never married).

Statistical analysis

First, the prevalence of past-year depression and associated standard errors among the whole population and stratified by each survey year were calculated from the year 2005 to the year 2015. Time trends in the prevalence of past-year depression were tested using logistic regression with continuous year as the predictor for the linear time trend. These analyses were conducted twice: first with no covariates (unadjusted) and then repeated while adjusting for age, gender, race/ethnicity, total annual family income, education, and marital status using the categories listed above.

Second, separate time trend analyses using logistic regression described above were conducted further stratified by either age, race/ethnicity, gender, total annual family income, or education. These analyses were conducted twice: once with no covariates (unadjusted model) and once controlling for the other demographic variables (adjusted model).

Differential time trends in past-year depression between each demographic variable were tested by two-way interactions of year × each demographic in logistic regression. A logistic

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regression of past-year depression found the two-way interaction of year ×age to be significant so the group-specific two-way interactions were further tested (i.e. 12–17 years old *v.* 18–25 years old; 12–17 years old *v.* 26–34 years old; 12–17 years old *v.* 35–49 years old; and 12–17 years old *v.* 50 years and older) in logistic regression. All analyses were performed incorporating the NSDUH sampling weights and controlling for the complex clustered sampling using SAS-callable SUDAAN Version 11.0.1 (RTI International, Research Triangle Park, NC) (http://www.rti.org/sudaan/).

Results

Trend in depression in the USA: 2005–2015

Overall, the prevalence of past-year depression increased significantly from 2005 to 2015 (see Fig. 1); this increase remained statistically significant after adjusting for demographic characteristics (see online Supplemental Table S1).

Depression in the USA from 2005 to 2015 by age

Stratifying the population by age, and adjusting for other demographics, significant increases in depression from 2005 to 2015 were observed among those 12–17 years old, 18–25 years old, and 50 years and older (see Fig. 2 and online Supplemental Table S2). There were no significant increases in depression observed among those 26–34 years old or 35–49 years old. There was a significant year × age interaction indicating that the increase in depression among youth ages 12–17 years old was significantly more rapid than the increases in every other age group. These trends remained significant and relatively unchanged after adjusting for demographic characteristics.

Depression in the USA from 2005 to 2015 by race/ethnicity

Stratifying the population by race/ethnicity, a significant increase in depression from 2005 to 2015 was observed among those who identified as non-Hispanic White (see Fig. 3 and online Supplemental Table S3). This increase remained significant after adjusting for demographic characteristics. Unadjusted analyses revealed a significant increase in depression among those who identified as Other race/ethnicity, though this increase was no longer significant after adjusting for other demographics. There was no significant change in depression observed among those of non-Hispanic Black or Hispanic race/ethnicity. The year × race/ethnicity interaction was not significant.

Depression in the USA from 2005 to 2015 by gender

The prevalence of depression increased significantly from 2005 to 2015 among both men and women (see Fig. 4 and online Supplemental Table S4). There was no significant difference in the rate of increase between men and women.

Depression in the USA from 2005 to 2015 by socioeconomic status indicators

There was a significant increase in depression from 2005 to 2015 among those in the lowest annual household income group and

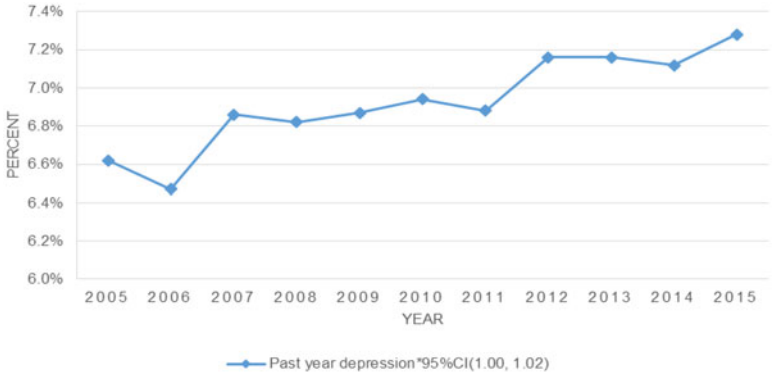

Fig. 1. Depression in the USA from 2005 to 2015.

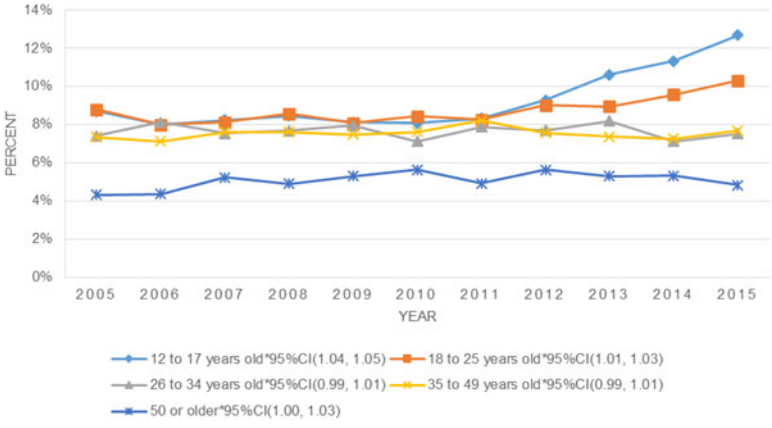

Fig. 2. Depression by age, 2005–2015.

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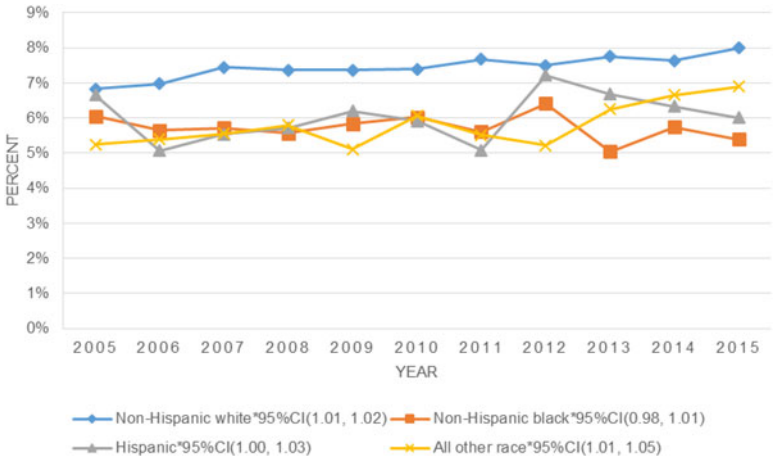

Fig. 3. Depression by race, 2005–2015.

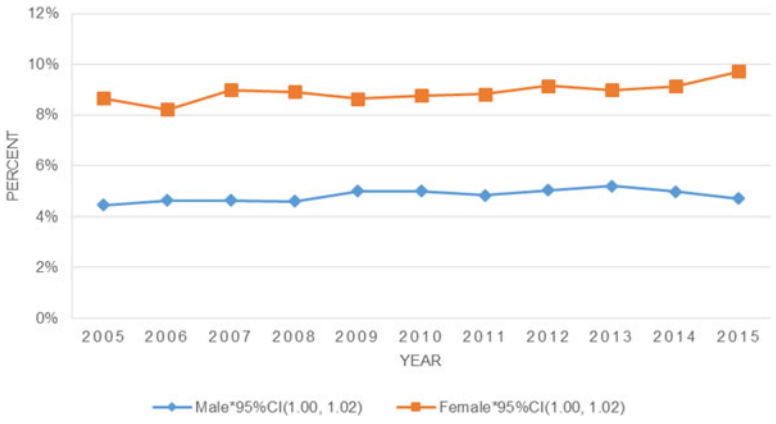

Fig. 4. Depression by gender, 2005–2015.

those in the highest annual household income group (see Fig. 5*a* and online Supplemental Table S5). These associations remained significant after adjusting for demographic characteristics. There was a significant increase in depression for those earning $50 000 to $74 999 per year; however, the increase did not remain significant after adjusting for other demographics. There were no changes observed in the prevalence of depression over time for the other middle-income group (i.e. $20 000–$49 000 per year). The year × income interaction was not significant.

In unadjusted analyses, the prevalence of depression increased significantly from 2005 to 2015 among those with some college education (see Fig. 5*b* and online Supplemental Table S6). This association remained significant after adjusting for demographic characteristics. The increase in depression prevalence was also significant for college graduates after adjusting for demographics. There was no change in the prevalence of depression from 2005 to 2015 among those with less than a high school education or high school graduates. The year × education interaction was not significant.

Discussion

The goal of the current study was to investigate trends in the prevalence of past-year depression from 2005 to 2015 for US persons age 12 years and older. Several key findings emerged. First, the overall prevalence of depression increased significantly over this period of time. Second, more rapid increases in depression prevalence occurred for specific demographic subgroups. Specifically, there was a significant increase in depression among the youngest (12–17 years old and 18–25 years old) and oldest (50 years and older) age groups and the increase was significantly more rapid among the youngest age group (12–17 years old) compared with every other age group. In terms of race/ethnicity, a significant increase in depression was seen only among non-Hispanic White individuals, though the rates of increase over time did not differ significantly by race/ethnicity. There were also significant increases in depression among those in the lowest income group and the highest income group; and among those in the highest education groups (some college or college degree and above) though, again, the rates of increase did not significantly differ by income or education.

Our data suggest an overall increase in depression prevalence in recent years among persons in the USA. The current study provides updated data on depression prevalences over time that are consistent with increases in depression prevalence found in older data on US and non-US adults (e.g. Compton *et al.* 2006; Hidaka, 2012) as well as increases in depression treatment (Olfson *et al.* 2002; Marcus & Olfson, 2010). The increase in depression prevalence over time is also consistent with increases in mental health problems over time seen in data from European countries (Katikireddi *et al.* 2012; Barr *et al.* 2015).

While demographic differences in depression prevalence at a single time point had been previously identified, the current study is novel in its examination of differences in trends in

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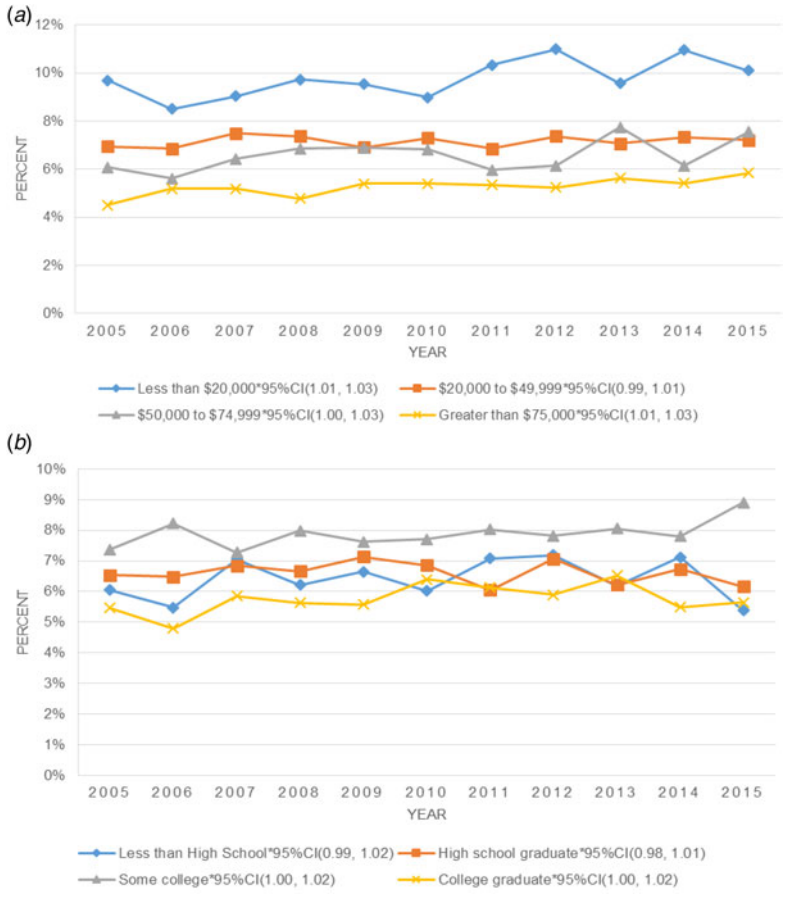

Fig. 5. Depression by socioeconomic status indicators (*a*, income; *b*, education) 2005–2015.

depression over time by demographic subgroups. With regard to age, past research found lower depression prevalences for younger and older adults (Pratt & Brody, 2014) yet studies have also reported increases in depression for adolescents and older adults (e.g. Akincigil *et al.* 2011; Skovlund *et al.* 2017). Our data suggest that the prevalence of depression is increasing faster for younger age groups than for middle and older age groups which may, over time, reduce the previously found prevalence differences among age groups.

On the other hand, past research found a higher prevalence of depression for White persons than most other race/ethnicities (Hasin *et al.* 2005) as well as greater increases in suicide over time for midlife White adults compared with other racial/ethnic groups (Case & Deaton, 2015). Our findings suggest that differences in depression and suicidal behavior between Whites and other racial/ethnic groups may be growing over time. Even though the trend lines for White persons *v.* other racial/ethnic persons did not differ significantly, White persons were the only racial/ethnic group in the current study that showed a significant increase in depression prevalence over time. With regard to gender, more women report depression than men (e.g. Hasin *et al.* 2005) and we found that both women and men demonstrate increasing depression prevalences over time with no differences in the rate of increase by gender. Finally, not only are lower SES indicators associated with a greater prevalence of depression (e.g. Hasin *et al.* 2005), those with lower incomes showed significantly increasing prevalences of depression over time that were not found for middle income groups. Notably, the increases in mortality for White persons mentioned above (Case & Deaton, 2015) were found to be greatest for persons with a high school education or less. These data can inform public health efforts aimed at reducing consequences of depression by going beyond determining which groups are reporting higher depression prevalences to bring attention and resources to those groups whose increase in depression over time is greater than others.

Even though the changes in depression by race/ethnicity were not statistically significant between groups, persons who identify as White demonstrated a significant increase of depression while the increase in depression for other racial/ethnic groups, such as persons who identify as Black, were not significant. Other research has reported a higher prevalence of depression and suicide for persons who are White compared with persons who are Black (Barnes *et al.* 2013; Case & Deaton, 2015; Barnes & Bates, 2017). This lower prevalence of depression and other mental disorders among Blacks compared with Whites stands in contrast to greater distress, greater stressors including inequality and discrimination, poorer health outcomes, and greater mortality experienced by US persons who are Black compared with those who are White, a difference that has been called the Black–White paradox (Williams & Earl, 2007; Keyes, 2009; Barnes & Bates, 2017). Further, the relationship between depression and health conditions is stronger for White adults than Black adults (Assari *et al.* 2015). The gap between Black persons and White persons in mental health increases when controlling for perceived discrimination (Keyes, 2009) and with greater educational attainment (Barnes *et al.* 2013). As our results found a significant increase in depression prevalence during the study period for White persons and no significant change for Black persons, it

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is possible that the mental health gap between Blacks and Whites may be widening over time.

There are a wide range of risk factors implicated in depression including environmental and genetic factors (e.g. Sullivan *et al.* 2000, Lorant *et al.* 2003, Kendler *et al.* 2006, Lopez-Leon *et al.* 2008, Colman & Ataullahjan, 2010, Shim *et al.* 2011, Hidaka, 2012) and it is important to understand which factor/s relate to these changes in depression. One environmental factor that may be implicated in increases in depression prevalence over time is stress. The majority of US adults report that their level of stress has increased over time (American Psychological Association, 2014). Money and work are cited as the most common reasons for stress for US adults (American Psychological Association, 2016) and low income, job loss/unemployment, and negative life events are risk factors for depression (Bonde, 2008). The time frame of the current study included 2008 and there is evidence for increases in mental health issues, including depression, from the years before to the years after the 2008 recession from European countries (Katikireddi *et al.* 2012; Economou *et al.* 2013; Barr *et al.* 2015). Further, there is evidence for increases in completed suicides in the USA and other countries around the world in the years after the 2008 recession (Reeves *et al.* 2012; Chang *et al.* 2013). A better understanding of factors related to increases in depression can inform clinical and public health intervention efforts (e.g. targeting stress, policies to increase employment or reduce economic stress).

With regard to depression among demographic subgroups, several studies in the USA that either included samples from specific states or cities (e.g. Detroit, Michigan) or included subsamples of adults in the USA (e.g. adults age 57 or older) showed relationships between the financial crisis of 2008 and increased depression, anxiety, and suicide rates in various demographic subgroups (Burgard *et al.* 2012; McLaughlin *et al.* 2012; Osypuk *et al.* 2012; Reeves *et al.* 2012; Cagney *et al.* 2014) and our data demonstrated similar subgroup differences at a US population level. There is evidence that the impact of financial-related stress may be disproportionate among men (Chang *et al.* 2013; Azorin *et al.* 2014), who show a stronger relationship between stressful life events and depression compared with women (Rice *et al.* 2015; Assari & Lankarani, 2016*b*); non-Hispanic White adults, who evidence a stronger relationship between depression and hopelessness (Assari & Lankarani, 2016*a*) and between depression and mortality (Assari *et al.* 2016) compared with non-Hispanic Black adults; and persons with lower incomes and lower levels of formal education (Burgard *et al.* 2012; McLaughlin *et al.* 2012; Chang *et al.* 2013). Case & Deaton (2015) found that White midlife adults, the group that reported the largest increases in mortality, reported increases in poor mental health, psychological distress, and difficulties with activities of daily living including being able to work over time. While stress is one potential contributor to increases in depression prevalence, more research is needed to clarify the role of stress and other factors involved in the increase in depression. More research is also needed to determine the best ways to target implicated factors in order to reduce depression prevalence, duration, and consequences especially in subgroups that are showing quicker increases in depression.

Attention to age-specific risk factors for depression is also needed. In the USA, teens report levels of stress that are comparable with adults (American Psychological Association, 2014) and the mental health of children is impacted by financial stress (Solantaus *et al.* 2004). A report using NSDUH data demonstrated an increase in the prevalence of depression in teens from 2005 to 2014 (Mojtabai *et al.* 2016) and our study expanded on these data to show that depression for youth is not just increasing but it is actually increasing faster than any other age group. Causes of the rise in depression in adolescents should be further explored as adolescents are increasingly exposed to risk factors derived from the use of new technologies, such as cyberbullying (Kessel Schneider *et al.* 2012) and problematic social media use (Lin *et al.* 2016; Shensa *et al.* 2017; see Seabrook *et al.* 2016 for a review and examiniation of moderators of social media and depression). Further, young adults may be impacted by economic-related stress through their family members or in terms of their own employment prospects. It is notable that Mojtabai *et al.* (2016) did not find a corresponding increase in mental health treatment along with the increase in depression prevalence for teens suggesting that the proportion of young people with depression who are not receiving treatment for their depression may be increasing over time as well. Efforts to understand depression among teens should also include examining ways to increase the utilization of depression treatments for this age group.

While there are a number of strengths to using the NSDUH data including yearly data collection, which allowed the examination of trends over time; the large sample sizes, which allowed the examination of trends in demographic subgroups; the recency of the data compared with other examinations of depression over time; and the representativeness of the sample to the US population, there are also a number of limitations. Additional research would also be needed to determine whether these results generalize to persons who were not included in the analytic sample (e.g. persons outside of the USA). An increase in depression prevalence over time may be due to an increase in the incidence of depression, an increase in the duration of depression, or a combination of both. We were not able to examine depression incidence in the current study due to the variables available for analysis. Additional important information would be gained from examining the incidence of depression over time overall and by demographic subgroups in future studies. Further, this study included waves of cross-sectional data that are subject to age, period, and cohort effects as well as biases related to retroactive recall. On a related note, cross-sectional data does not allow the examination of individuals over time, specifically the impact of changes in variables potentially related to depression (e.g. employment and financial issues) and how these changes are associated with changes in depression prevalence. Where these data exist, it is important for researchers to examine factors that may be driving changes in depression over time in longitudinal data.

Additional research is needed to understand potential mediators of the increase in depression overall and for specific demographic subgroups. It is likely that there are multiple pathways to increases in depression prevalence; including increases in incidence, increases in duration, and delayed or less access to treatment; and a well-considered model includes a combination of family/genetic and environmental factors (Rubio *et al.* 2011; WHO, 2016). While environmental changes are more likely to be related to the increase of depression incidence or duration than biological/genetic changes due to the short time frame, it would be important to study a range of potential variables that are associated with the increase in depression in order to provide the best prevention and intervention efforts to US persons. The subgroups most

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affected by the increase in depression prevalence may offer some clues to what the underlying causes of the increase might be, and these require further research.

Over the past 11 years, the prevalence of past-year depression increased significantly overall in the USA and the increases were most concentrated among youth, non-Hispanic White persons, those in the lowest income group, and those in the highest education and income groups. While not always diagnosed, depression is among the most treatable mental disorders. Identifying subgroups that are experiencing significant and/or greater increases in depression over time can help guide the allocation of funding and resources toward the subgroups that are facing the greatest individual and societal consequences from depression. Further research into understanding the macro level, micro level, and individual factors that are contributing to the observed increase in depression, including factors specific to depression in demographic subgroups, would also help to direct public health prevention and intervention efforts.

Supplementary Material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291717002781

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Declaration of Interest. None.

Ethical Standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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