Depression in the US Population During the Time Periods Surrounding the Great Recession

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ABSTRACT

Objective: To determine whether the time periods surrounding the 2008 US economic downturn were accompanied by an increase in prevalence of depression in the US adult population.

Method: We used data from the 24,182 adults aged ≥ 18 years who participated in the National Health and Nutrition Examination Survey during 2005–2012. A cross-sectional analysis was performed at each time period to determine prevalence of major and other depression as assessed by standardized questionnaires based on 9 criteria for major depressive episodes defined by *DSM-IV*.

Results: The demographic characteristics of the US population were similar across time periods except for the percentage of adults living in poverty, which increased from 26.43% during 2005–2006 to 33.46% during 2011–2012. The prevalence of major depression increased from 2.33% (95% CI, 1.64%–3.01%) during 2005–2006 to 3.49% (95% CI, 2.84%–4.03%) in 2009–2010 to 3.79% (95% CI, 3.01%–4.57%) in 2011–2012. Prevalence of other depression increased from 4.10% (95% CI, 3.37%–4.88%) in 2005–2006 to 4.79% (95% CI, 4.10%–5.44%) in the 2009–2010 period but then declined to 3.68% (95% CI, 2.84%–4.48%) in the 2011–2012 time period ($P = .4$). After adjustment for the distribution of age, sex, race/ethnicity, education, insurance status, and poverty status in the US adult noninstitutionalized population, each 2-year period after the 2005–2006 time period was associated with a 0.4% increase in major depression prevalence ($P < .001$). No significant differences in other depression prevalence were noted by time period ($P = .6$).

Conclusions: The time periods surrounding the recent economic recession were accompanied by a significant and sustained increase in major depression prevalence in the US population. It is plausible that the recession, given its strong, persistent, and negative effects on employment, job and housing security, and stock investments, contributed to the sustained increase in prevalence of major depression in the US population, but other factors associated with the recession time period could have played a role. The impact of the economic downturn on depression prevalence should be considered when formulating future policies and programs to promote and maintain the health of the US population.

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Economic downturns have a negative impact on mental health, and this association is quite likely mediated through multiple mechanisms including unanticipated loss of employment, job insecurity, housing loss, and loss of savings and investments.[1] The current economic crisis that technically began in December 2007 remains one of the worst recessions in US history not only due to its impact on employment and housing, but also because of its lasting effects on consumer confidence.[2] Over 8 million jobs were lost[3] and approximately 3 million homes were foreclosed during the past decade.[4] Given the strong link between unanticipated disruptions in income and housing and need for mental health services,[5–10] the recent economic recession quite likely had a significant impact on population mental health. We used data from a nationally representative sample of US adults to explore the population impact of the most recent economic downturn and one of the worst recessions in US history on mental health. We examined temporal trends in major depression during time periods both before and after the recession that began in 2008. We hypothesized that the time periods surrounding the economic downturn in the United States that began in 2008 were accompanied by an increase in prevalence of both major and other depression.

METHOD

Participants

This analysis utilized data from the National Health and Nutrition Examination Survey (NHANES) conducted during 2005 to 2012. The NHANES are continuous cross-sectional probability samples of the total civilian noninstitutionalized population. Each 2-year survey period (2005–2006, 2007–2008, 2009–2010, 2011–2012) followed a stratified, multistage probability design in which a sample of the noninstitutionalized US population was surveyed. The analysis included a total of 40,790 individuals, composed of 10,348 in 2005–2006, 10,149 in 2007–2008, 10,537 in 2009–2010, and 9,756 in 2011–2012. Analysis was then restricted to 24,182 individuals 18 years or older (5,563 in 2005–2006, 6,228 in 2007–2008, 6,527 in 2009–2010, and 5,864 in 2011–2012). We excluded participants (n = 3,377) with missing information from the depression questionnaire, which included 727 for the 2005–2006 period, 781 for the 2007–2008 period, 954 for the 2009–2010 period, and 915 for the 2011–2012 period. The analysis was then limited to 20,805 adults total (4,836 in 2005–2006, 5,447 in 2007–2008, 5,573 in 2009–2010, and 4,949 in 2011–2012). The survey was approved by the National Center for Health Statistics Institutional Review Board, and all participants provided written informed consent. Details of the survey design may be found in the NHANES operations manual.[11]

Clinical Points

- The recent US economic recession remains one of the worst in US history, second only to the Great Depression. The population impact of this recent recession on mental health has not been previously explored.
- This study demonstrates that the time period after the recession was accompanied by a significant and sustained increase in major depression prevalence in the US population.

Assessments and Outcome Measures

Information on depression was collected in NHANES using the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 queries presence of 9 criteria for major depressive episodes defined by the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (*DSM-IV*) and scores each of the 9 *DSM-IV* depression criteria as 0 (not at all) to 3 (nearly every day). Participants were asked to choose 1 of 4 responses about the frequency of depressive symptoms during the previous 2 weeks. The responses ranged from 0 (not at all) to 3 (nearly every day) so that each of the *DSM-IV* depression criteria could be scored and summed. The Depression Screener questions were asked by trained interviewers using the Computer-Assisted Personal Interviewing system as part of the Mobile Examination Center private interview in Spanish or English. No proxies or interpreters were permitted for these questions. *Major depression* was defined as the participant reporting the presence of 5 or more of the 9 depression criteria during the same 2-week period most of the day, nearly every day, and 1 of the criteria present must include depressed mood or loss of interest. *Other depression* was defined as the participant reporting the presence of at least 2 depression criteria during more than half the days for the past 2 weeks, with 1 of the criteria being depressed mood or loss of interest, but the participant did not meet criteria for major depression. Criterion validity has previously been assessed among 580 patients attending a primary care clinic who underwent a structured psychiatric interview by a mental health professional to determine presence of major depression based on *DSM-IV* diagnostic criteria. Receiver operating curve analysis showed that the PHQ-9 demonstrated excellent discrimination of major depression (area under the curve = 0.95).[12] The PHQ-9 has also been shown to be effective for the detection of major depression in racially diverse populations and in adult primary care patients,[13,14] but it has not been validated as an instrument to assess subsyndromal depression.

Information on participant demographics, education, insurance status, and family income was obtained from standardized questionnaires completed during a home visit. Age was categorized in 5 groups: 18–24 years, 25 to 34 years, 35 to 44 years, 45 to 64 years, and ≥ 65 years. Race/ethnicity was self-reported and categorized as non-Hispanic white, non-Hispanic black, other race/ethnicity, and Hispanic, which included participants who self-reported race/ethnicity as Mexican American or other Hispanic. Education status was categorized as less than a high school education, completion of high school or General Educational Development (GED) equivalent, or completion of an associate's degree or higher. Health insurance status was defined as either having any health insurance, including Medicare, Medicaid, or private health insurance, or having no insurance. Participants were asked to sum the income of all household members, with "income" including income, social security, or unemployment compensation. This summed household income was then divided by the US Census Bureau poverty threshold, which varies with the year and the number and ages of the family members, to calculate the poverty-income ratio.[15] A poverty-income ratio < 1.85 was used to define poverty status because this threshold is used to define eligibility for numerous federal and state funded assistance programs.[16]

The employment-population ratio (EMR) was utilized to graph temporal trends in US employment with temporal trends in prevalence of major and other depression in the US population. The EMR, calculated every month by the Bureau of Labor Statistics,[17] is the total number of US employed civilians divided by the total noninstitutionalized working age population. Changes in this ratio reflect net changes in the number of jobholders relative to changes in the size of the population. The average EMR for each of the four 2-year time periods (2005–2006, 2007–2008, 2009–2010, and 2011–2012) was then calculated on the basis of yearly averages reported by the Bureau of Labor Statistics.[18]

Statistical Analyses

The analysis accounted for the cluster and strata statement of the complex survey design and the sampling weights to adjust for the unequal probabilities of selection, oversampling, and nonresponse. Sample weights for each 2-year period (NHANES 2005–2006, 2007–2008, 2009–2010, 2011–2012) were utilized so that temporal trends in major and other depression could be examined. The estimated prevalence and its confidence interval for major and other depression were examined across 4 time periods (2005–2006; 2007–2008, 2009–2010, and 2011–2012) by gender, race/ethnicity, education status, health insurance status, and poverty status after age adjustment to the 2000 US Census. To determine whether depression prevalence differed significantly by time period, a generalized linear model with identity link and binomial distribution was used to estimate differences in depression prevalence by time period while adjusting for the distribution of age, sex, race/ethnicity, health insurance status, and poverty status. Briefly, time is entered into the regression model as 0, 1, 2, and 3, representing each of the 4 consecutive time periods. We ascertained significant differences in depression prevalence by time period by examining the statistical significance of the parameter associated with time. Similarly, the method was used for testing differences in depression prevalence by sex (male vs female), race/ethnicity (white vs nonwhite), health insurance status (insured versus uninsured), and poverty status (yes/no) while adjusting for the time period. Statistical significance was set as a P value < .05, and all analyses were performed using Stata version 12 (Statacorp LP).

Table 1. Demographic Characteristics of the US Adult Population by Time Period, % (n)

Characteristic	2005–2006 (n = 4,836)	2007–2008 (n = 5,447)	2009–2010 (n = 5,573)	2011–2012 (n = 4,949)
Age				
18–24 y	12.88 (968)	12.81 (672)	12.27 (742)	13.44 (753)
25–34 y	17.49 (848)	16.95 (786)	17.20 (841)	16.86 (780)
35–44 y	19.70 (732)	18.88 (881)	18.32 (904)	15.90 (727)
45–64 y	33.65 (1,289)	35.18 (1,788)	34.94 (1,811)	36.24 (1,625)
≥ 65 y	16.28 (999)	16.19 (1,320)	17.26 (1,275)	17.55 (1,064)
Male	48.51 (2,331)	48.63 (2,707)	49.45 (2,772)	49.33 (2,498)
Race/ethnicity				
Hispanic[a]	11.12 (1,168)	13.51 (1,577)	13.78 (1,613)	13.76 (989)
Non-Hispanic white	72.82 (2,336)	69.85 (2,546)	68.86 (2,694)	67.49 (1,842)
Non-Hispanic black	11.12 (1,148)	11.27 (1,127)	11.04 (988)	11.33 (1,328)
Other race	4.94 (184)	5.37 (197)	6.32 (278)	7.43 (790)
Education				
Less than high school education	16.98 (1,167)	19.97 (1,575)	18.33 (1,466)	15.75 (1,054)
High school diploma or GED equivalent	24.90 (1,030)	25.15 (1,283)	23.02 (1,229)	20.43 (986)
Associate's degree or higher	58.11 (2,122)	54.87 (2,328)	58.65 (2,601)	63.82 (2,621)
No health insurance	18.45 (1,083)	19.48 (1,315)	20.54 (1,435)	19.43 (1,154)
Below poverty status	26.43 (1,883)	29.41 (2,242)	30.31 (2,411)	33.46 (2,257)

[a]Includes participants reporting race/ethnicity as either Hispanic or Mexican American.
Abbreviation: GED = General Educational Development.

Figure 1. Prevalence of Major Depression in the Total US Adult Noninstitutionalized Population and the US Employment-Population Ratio by Time Period

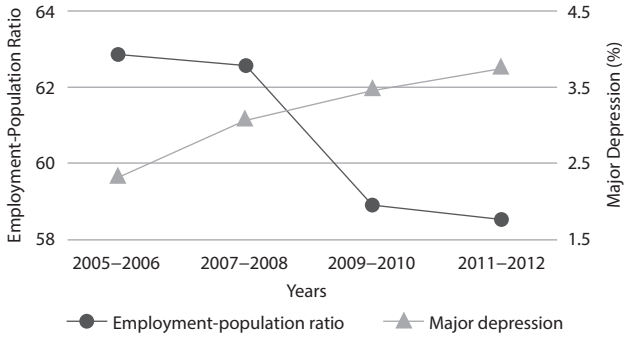
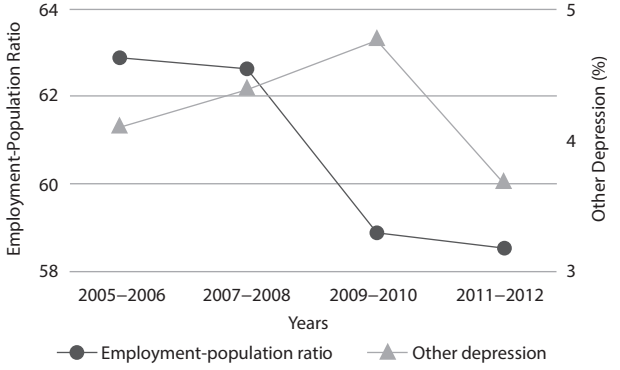


Figure 2. Prevalence of Other Depression in the Total US Adult Noninstitutionalized US Population and the US Employment-Population Ratio by Time Period



RESULTS

Table 1 shows the distribution of age groups, sex, and racial/ethnic categories across the 4 survey time periods. The percentage of adults living in poverty increased from 26.43% during 2005–2006 to 33.46% during 2011–2012. The percentage of adults with no health insurance increased from 18.45% during 2005–2006 to 20.54% during 2009–2010 but then declined to 19.43% during 2011–2012. Figures 1 and 2 show the downward trend of the EMR from 62.9 in 2005–2006 to 58.9 in 2009–2010, indicating a drop in total number of employed among all employable US adults. This decline in EMR was then sustained during 2011–2012. Concurrent with this downward trend in EMR was an increasing prevalence of major depression in the total US adult noninstitutionalized population (Figure 1). Major depression prevalence increased from 2.33% (95% CI, 1.64%–3.01%) during 2005–2006 to 3.49% (95% CI, 2.84%–4.03%) in 2009–2010 to 3.79% (95% CI, 3.01%–4.57%) in 2011–2012. Prevalence of other depression increased from 4.10% (95% CI, 3.37%–4.88%) in 2005–2006 to 4.79% (95% CI, 4.10%–5.44%) in the 2009–2010 period but then declined to 3.68% (95% CI, 2.84%–4.48%) in the 2011–2012 time period (Figure 2) ($P = .4$).

Tables 2 and 3 show the unadjusted prevalence of major depression and other depression, respectively, by age, sex, race/ethnicity, education, health insurance status, income status, and time period. After adjustment for the time period, age distribution, race/ethnicity, education and poverty status, major depression prevalence was consistently higher among women compared to men ($P < .001$), nonwhites (Hispanics, non-Hispanic blacks, and other race as 1 group) compared to whites ($P < .001$), and those without health insurance status compared to those with health insurance ($P < .001$). Individuals living in poverty had a higher prevalence of depression compared to those not living in poverty ($P < .001$) (Table 2). No significant differences in other depression prevalence were noted for any of the subgroups after adjustment for the time period and the demographics of the US population.

Table 2. Weighted Prevalence of Major Depression in the US Population by Demographic Characteristics and by Time Period, % (95% CI)

Characteristic	2005–2006 (n = 4,836)	2007–2008 (n = 5,447)	2009–2010 (n = 5,573)	2011–2012 (n = 4,949)
Age				
18–24 y	1.87 (1.10–2.65)	1.39 (0.01–2.77)	2.94 (0.93–4.95)	3.47 (1.28–5.65)
25–34 y	1.96 (0.84–3.08)	2.19 (0.94–3.44)	2.89 (1.37–4.41)	2.85 (1.42–4.28)
35–44 y	1.98 (0.69–3.27)	4.39 (2.96–5.82)	4.17 (2.63–5.71)	3.52 (1.49–5.55)
45–64 y	3.70 (2.52–4.87)	4.07 (2.37–5.76)	4.71 (3.58–5.84)	5.40 (3.76–7.05)
≥ 65 y	0.68 (2.10–3.75)	1.71 (0.91–2.50)	1.27 (0.55–1.98)	1.84 (1.05–2.62)
Gender				
Male	1.70 (0.99–2.40)	2.02 (1.26–2.78)	2.62 (1.95–3.30)	3.26 (2.18–4.35)
Female[a]	2.93 (2.10–3.75)	4.09 (2.92–5.26)	4.33 (3.51–5.15)	4.30 (3.31–5.28)
Race/ethnicity				
Hispanic	2.55 (1.15–3.94)	3.20 (2.41–3.99)	4.14 (3.38–4.90)	4.87 (3.13–6.61)
Non-Hispanic white	2.17 (1.42–2.92)	2.77 (1.57–3.98)	2.95 (2.31–3.60)	3.57 (2.47–4.67)
Non-Hispanic black	3.69 (1.86–5.51)	4.77 (3.09–6.45)	6.60 (4.88–8.32)	4.81 (3.41–6.21)
Other race	1.10 (0.42–2.61)	3.27 (0.26–6.28)	2.41 (0.39–4.43)	2.18 (1.00–3.36)
Education				
Less than high school[a]	3.16 (2.02–4.30)	5.73 (4.01–7.45)	6.16 (4.59–7.74)	8.04 (5.42–10.6)
High school diploma/ GED equivalent	3.26 (1.61–4.91)	3.59 (1.92–5.26)	3.18 (2.19–4.17)	4.71 (2.73–6.69)
Associate's degree or higher	1.74 (1.04–2.44)	1.99 (1.35–2.63)	2.80 (2.13–3.46)	2.55 (1.75–3.34)
Insurance status				
Health insurance[a]	1.83 (1.19–2.46)	2.75 (1.88–3.61)	3.24 (2.64–3.84)	3.60 (2.79–4.41)
No health insurance	4.55 (2.48–6.63)	4.48 (2.79–6.17)	4.46 (3.29–5.64)	4.55 (2.75–6.34)
Poverty status				
Below poverty status[a]	5.23 (3.96–6.50)	5.44 (4.32, 6.57)	6.68 (5.69–7.66)	7.30 (5.60–9.01)
Above poverty status	1.29 (0.75–1.82)	2.10 (1.08–3.12)	2.10 (1.50–2.69)	0.36 (1.30–2.74)

[a]$P < .001$ as significantly higher (regardless of time period) compared to comparable group (men vs women, less than high school education vs high school education or higher, poverty status vs no poverty status) after adjustment for the time period, age distribution, race/ethnicity, education, and poverty status of the US adult noninstitutionalized population.
Abbreviation: GED = General Educational Development.

After adjustment for the distribution of age, sex, race/ethnicity, education, insurance status, and poverty status in the US adult noninstitutionalized population, each 2-year time period increment was associated with a 0.4% increase in major depression prevalence ($P < .001$) during the 2005–2012 time period. No significant differences in other depression prevalence by time period were noted ($P = .6$) after adjustment for confounders.

DISCUSSION

This study demonstrates a significant and sustained increase in major depression prevalence in the US adult population during the time period surrounding the most recent US economic recession. This study focused on the entire adult noninstitutionalized population and thus included adults who are employable and those who are either not employable (eg, due to age or poor health) or not seeking employment (eg, students or homemakers). The drop in the EMR during the recession period demonstrates the strong impact of the recent recession on US employment, which may have impacted depression prevalence. This cross-sectional analysis across multiple time periods cannot determine the root causes for the population level increase in major depression and can only show a correlation between the time period of the economic recession and population prevalence of major depression. It is certainly possible that other factors associated with the time period surrounding the economic recession played a role in population prevalence of major depression (eg, political conflict, ongoing military operations). However, given the strong, persistent, and negative effects of the recession on employment, job and housing security, and stock investments, it is plausible that the recession contributed to the sustained increase in prevalence of major depression in the US population. For example, one study[19] showed that adults over the age of 50 years whose stock holdings were substantially reduced due to the recession had a nearly 50% increase in reported depression and a 35% increase in the likelihood of using antidepressant medications. Cagney and colleagues[6] linked data from the National Social Life, Health, and Aging Project (2005–2006 and 2010–2011 waves) with data on zip code–level foreclosure rates in order to determine the association between measures of depression and economic distress as measured by foreclosure rates. Large increases in foreclosures from 2005 to 2006 (pre-recession) to 2010–2011 (post-recession) were associated with depression among older adults. The recession may have also led to insecurity about future self or family employment and fear of impending economic instability. Such factors may impact the mental health of individuals who are not employed or not currently seeking employment.

The findings of this study are also supported by previous studies, which demonstrated increases in the US suicide rate during the time period of the economic recession.[20,21]

Table 3. Weighted Prevalence of Other Depression in the US Adult Population by Demographic Characteristics and by Time Period, % (95% CI)

Characteristic	2005–2006 (n = 4,836)	2007–2008 (n = 5,447)	2009–2010 (n = 5,573)	2011–2012 (n = 4,949)
Age				
18–24 y	3.29 (1.69–4.88)	4.10 (2.87–5.33)	5.28(3.4 2–7.15)	3.90 (1.93–5.87)
25–34 y	3.64 (2.39–4.90)	3.42 (1.58–5.25)	4.30 (3.03–5.57)	2.79 (1.40–4.18)
35–44 y	3.93 (2.28–5.58)	4.32 (2.87–5.76)	3.64 (2.67–4.60)	2.12 (1.06–3.17)
45–64 y	4.40 (3.28–5.52)	4.41 (3.24–5.57)	5.68 (4.40–6.96)	4.94 (3.30–6.58)
≥ 65 y	4.84 (3.28–6.41)	5.66 (2.97–8.34)	4.32 (3.20–5.44)	3.18 (2.28–4.07)
Gender				
Male	3.49 (2.77–4.22)	4.10 (2.96–5.25)	4.50 (3.65–5.35)	2.93 (1.80–4.06)
Female	4.68 (3.65–5.71)	4.65 (3.60–5.71)	5.07 (4.14–5.99)	4.41 (3.07–5.75)
Race/ethnicity				
Hispanic	5.04 (3.38–6.71)	5.47 (4.61–6.33)	7.12 (5.96–8.29)	5.08 (2.84–7.32)
Non-Hispanic white	3.40 (2.51–4.29)	4.09 (2.78–5.39)	3.81 (3.07–4.54)	2.84 (1.79–3.90)
Non-Hispanic black	7.14 (4.73–9.55)	4.85 (3.30–6.40)	6.96 (5.85–8.07)	6.46 (4.33–8.59)
Other race	5.58 (2.09–9.06)	4.56 (1.74–7.38)	6.56 (2.69–10.4)	4.42 (3.12–5.72)
Education				
Less than high school	8.10 (6.50–9.71)	8.18 (6.02–10.3)	9.00 (7.31–10.6)	6.45 (4.27–8.6)
High school diploma/ GED equivalent	4.87 (3.22–6.50)	3.97 (2.33–5.60)	5.34 (3.37–7.31)	4.95 (3.11–6.88)
Associate's degree or higher	2.71 (2.05–3.37)	3.21 (2.33–4.09)	3.15 (2.39–3.91)	2.46 (1.54–3.38)
Insurance status				
Health insurance	3.74 (3.09–4.39)	4.06 (3.14–4.97)	4.19 (3.57–4.82)	3.17 (2.22–4.12)
No health insurance	5.70 (4.14–7.27)	5.76 (4.24–7.27)	7.11 (5.40–8.82)	5.80 (4.11–7.49)
Poverty status				
Below poverty status	6.46 (5.02–7.90)	7.60 (6.27–8.93)	7.79 (6.63–8.96)	6.75 (5.29–8.21)
Above poverty status	3.26 (2.59–3.92)	3.05 (2.17–3.93)	3.48 (2.88–4.08)	2.13 (1.40–2.87)

Abbreviation: GED = General Educational Development.

From 2007 to 2010, there were an estimated 4,750 excess suicide deaths compared to the expected suicide death rates based on previous years,[20] with the number of suicide deaths actually exceeding the number of motor vehicle deaths in the United States.[21] This increase in suicide mortality is similar to the increase in suicide mortality that occurred during the Great Depression of the 1930s.[22]

This study also shows that within the US adult population the prevalence of both major and other depression is highest among those living in poverty and those with less than a high school education. The mental health of these vulnerable populations may be most affected during time periods of economic distress, but more research is needed. Times of recession are challenging for maintaining the mental health of the population. The findings from this study as well as other studies[3,6–10] suggest that times of financial stress may be accompanied by an increased need for mental health services in both primary and secondary care. We utilized a poverty-income ratio of 1.85 to indicate poverty status because this threshold is used to indicate eligibility for many federal and state financial assistance programs.[16] The US Census Bureau provides information on poverty rates using a range of poverty-income ratios, but poverty rates based on a poverty-income ratio of 1.0 are most frequently reported.

The strengths of this study include the use of a multistage survey design with depression prevalence estimates reflecting the prevalence within the noninstitutionalized US adult population. Determination of depression was based on questions that reflect an individual's attitudes and memory at the time of the home examination and could not be validated against a structured clinical interview. However, any error in estimating prevalence of major depression or other depression should be consistent across time. The PHQ-9 was developed in 1999 and is based on the 9 *DSM-IV* criteria for major depressive disorder. The PHQ-9 does not address the *DSM-IV* exclusion criteria for a depressive disorder and cannot delineate a depressive disorder as part of another illness. Given that foreclosure rates and drops in employment were not uniform across the United States, the impact of the 2008 recession quite likely differed from state to state. We could not examine temporal changes in depression prevalence by US states and could only quantify depression prevalence for the total noninstitutionalized US adult population. This study utilized cross-sectional survey data whereby each 2-year sample included a new set of respondents. Thus, we could not examine the association between an economic downturn and development of major depression within an individual. This study focuses on the population level of depression, and associations found at a population level may not be applicable at an individual level. However, our study is supported by findings from multiple cohort studies that followed adults over pre- and post-recession time periods. These previous studies have demonstrated that measures of economic stress associated with the recession, such as home foreclosures, loss of non-housing wealth, and job insecurity, are associated with increased likelihood of depression and/or use of depression medications within an individual.[6,8,10,19]

CONCLUSIONS

This study shows a significant and sustained increase in major depression prevalence since the 2005–2006 survey

period. The impact of the economic downturn on depression prevalence should be considered when formulating future policies and programs to promote and maintain the health of the US population.

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