Depressive Symptoms, Unemployment, and Loss of Income

The CARDIA Study

Mary A. Whooley, MD; Catarina I. Kiefe, MD, PhD; Margaret A. Chesney, PhD; Jerome H. Markovitz, MD†; Karen Matthews, PhD; Stephen B. Hulley, MD, MPH

Background: Previous studies have suggested an association between depression and low socioeconomic status, but few have empirically examined the effect of depressive symptoms on income and employment over time.

Objective: To determine whether depressive symptoms are associated with subsequent unemployment or loss of family income.

Methods: We performed a prospective cohort study of 5115 adults aged 18 to 30 years. These participants included approximately equal numbers of African Americans and whites and men and women from 4 cities in the United States who completed the 1990-1991 examination of the Coronary Artery Risk Development in Young Adults (CARDIA) study. For this analysis, we included 2334 participants who were employed full or part time and who reported an annual family income of $25000 or more. Participants completed the Center for Epidemiologic Studies Depression Scale and were considered to have depressive symptoms if they scored 16 or higher on the 60-point scale. We evaluated self-reported unemployment and annual family income during 5 years of follow-up.

Results: Thirty-three percent (118/354) of participants with depressive symptoms (Center for Epidemiologic Studies Depression Scale score ≥16) in 1990-1991 and 21% (335/1581) of participants without substantial depressive symptoms (Center for Epidemiologic Studies Depression Scale score <16) reported new unemployment during the subsequent 5 years (odds ratio, 1.9; 95% confidence interval, 1.4-2.4; P<.001). This association remained strong after adjusting for potential confounding variables, including marital status, education, history of unemployment, current part-time (vs full-time) employment, and cigarette smoking (odds ratio, 1.6; 95% confidence interval, 1.2-2.0; P=.001). Seventeen percent (62/371) of participants with depressive symptoms and 7% (113/1631) of participants without substantial depressive symptoms in 1990-1991 reported that their family income had decreased below $25000 by 1995-1996 (odds ratio, 2.7; 95% confidence interval, 1.9-3.8; P<.001). This association also remained strong after adjusting for potential confounding variables (odds ratio, 1.9; 95% confidence interval, 1.3-2.7; P<.001).

Conclusions: Depressive symptoms are associated with subsequent unemployment and loss of family income among working young adults. Socioeconomic indicators, such as income and employment, should be considered in evaluating the potential benefits of treatment for patients with depressive symptoms.

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According to the Global Burden of Disease Study, major depression was the fourth leading cause of worldwide disability in 1990 and will rank second by the year 2020, surpassed only by ischemic heart disease.1 The results of several randomized trials demonstrating improved work performance among patients who receive treatment for depression2-7 suggest that depressed patients may be at increased risk for unemployment. Depression is associated with decreased productivity in the workplace and an increased risk of work absenteeism,8,9 but previous studies have not specifically examined whether depressive symptoms lead to subsequent unemployment and loss of income over time.

Measuring the effects of depressive symptoms on subsequent employment and income is important for determining the costs and economic burden associated with depression and for estimating the potential cost-effectiveness of treatment interventions for depression.14 Income and employment are themselves clinically relevant outcomes because poor socioeconomic status is associated with greater medical morbidity and mortality.15-18 We performed a longitudinal study to examine the association of depressive symptoms with new unemployment and loss of family income during 5 years of follow-up among...
young to middle-aged adults who were initially employed with an annual family income of $25000 or higher.

**METHODS**

**SUBJECTS**

In 1985-1986, 5115 young adults aged 18 to 30 years, including roughly equal numbers of African Americans and whites and men and women, were recruited from 4 US cities (Birmingham, Ala; Chicago, Ill; Minneapolis, Minn; and Oakland, Calif) for the Coronary Artery Risk Development in Young Adults (CARDIA) study. The study design and baseline characteristics of the participants have been published previously. In brief, this prospective cohort study was designed to describe the distribution and evolution of coronary heart disease risk factors in young adults and to identify associated habits, behaviors, and lifestyles. Participants were recruited primarily through telephone contact, except in Oakland, where a health plan membership roster was used. Door-to-door contact was used in some areas of Minneapolis where telephone contact was difficult. The appropriate institutional review boards approved the study, and all participants provided written informed consent.

In 1990-1991, 4291 participants (84%) completed the Center for Epidemiologic Studies Depression scale (CES-D). We determined annual family income using a self-report question that asked each participant to select 1 of 8 categories indicating his or her total combined family income for the prior 12 months: less than $5000; $5000-$11999; $12000-$15999; $16000-$24999; $25000-$34999; $35000-$49999; $50000-$74999; or $75000 or higher. To minimize the likelihood that baseline differences in employment and income between depressed and nondepressed participants would affect the association of depressive symptoms with subsequent unemployment and loss of income, we first excluded all participants who had low income (<$25000) or unemployment at baseline, and then examined the association of baseline depressive symptoms with new low income and unemployment 5 years later among the remaining participants (Figure 1). Therefore, for the present analysis, we included 2334 participants (54%) who reported an annual family income of $25000 or more in 1990-1991 and who answered yes to 1 of the following 2 questions: “Are you working full-time?” or “Are you working part-time?” Participants who did not answer yes to either of the employment questions but who said they were keeping house or raising children were considered unemployed because both “working” and “nonworking” participants reported keeping house or raising children; thus, the variable did not appear to specifically identify full-time homemakers.

**MEASUREMENTS**

**Depressive Symptoms**

We administered the CES-D to study participants in 1990-1991. The CES-D is a validated and reliable, 20-item, self-report scale designed to detect the presence of current depressive symptoms. Higher scores indicate more severe depressive symptoms. We used the standard cutoff of 16 or more of 60 possible points to define the presence of depressive symptoms. This cutpoint has a sensitivity of about 80% and a specificity of about 73%, compared with a structured clinical interview for major depression. To examine the association of depressive symptoms at initial and follow-up examinations with loss of family income and unemployment in the interim, we readministered the CES-D in 1993-1996. Although CARDIA study participants were reexamined in 1992-1993, the CES-D was not administered at that time.

**Outcomes**

We reevaluated annual family income in 1995-1996 by asking each participant which of the same 8 income categories (see the “Subjects” subsection of the “Methods” section) best described his or her total combined family income for the prior 12 months. Participants who reported an annual income of less than $25000 in 1995-1996 were considered to have new low family income. We decided against using the next lower cutoff point (<$16000) to define low income because the US Census Bureau poverty threshold for a family of 4 in 1996 was $16036, and we were concerned that too few participants would have fallen below this poverty threshold to adequately assess the association between depressive symptoms and subsequent low income. We evaluated self-reported unemployment in 1990-1991, 1992-1993, and 1995-1996 by asking participants, “Since your last CARDIA examination on [date], have you been unemployed and looking for work for more than 2 months?” We defined new unemployment as a yes answer to this question in 1992-1993 or 1995-1996, and we used the 1990-1991 response as a covariable in multivariate analyses.

**Other Measurements**

In 1990-1991, we measured self-reported age, sex, ethnicity, marital status, education, annual family income, history of unemployment during the past 3 years, current full- or part-time employment, smoking, alcohol use, home ownership, and number of persons in the household. We measured number of persons in the household again in 1999-1996 to determine whether a change in household number affected the association between depression and income or employment. We determined social network adequacy in 1987-1988 using 4 questions (“How often do you . . .”: “feel lonely,” “find yourself wishing someone would comfort you,” “feel that other people really care for you,” and “wish you had more close friends?”) with 4 possible response categories (“frequently,” “occasionally,” “rarely,” and “never”). Participants had to answer at least 2 questions to receive a score. For the 4 (of 2334) participants who completed only 2 or 3 items, we assigned the mean value of the nonmissing responses to the other items. Higher scores indicate better social network adequacy.
STATISTICAL ANALYSIS

We compared differences in characteristics between those with and without substantial depressive symptoms using χ² tests for dichotomous variables and t tests for continuous variables. We used backwards elimination logistic regression analysis (with P < .05 to keep variables in the model) to examine the risk of new unemployment between 1990-1991 and 1995-1996 and the risk of new low family income ($25000) in 1995-1996 in participants who had depressive symptoms (CES-D score ≥16) compared with those who did not have substantial depressive symptoms (CES-D score <16) in 1990-1991 (Figure 1). We added any variables that were associated with the outcome (at P<.05) to multivariate models that included depression. For these analyses, we reported odds ratios (ORs) with 95% confidence intervals (CIs). Because the CARDIA study was designed to examine differences among African American men, African American women, white men, and white women, we also report subset analyses for these 4 subgroups. Tests of P for trend were calculated by χ² for trend in proportions (Figure 2). Analyses were performed with the use of Statistical Analysis Software, version 6.12 (SAS Institute, Cary, NC).

RESULTS

CHARACTERISTICS OF PARTICIPANTS

In 1990-1991, 439 (19%) of the 2334 participants had depressive symptoms (CES-D score ≥16) (Table 1). Compared with those without substantial depressive symptoms (CES-D score <16), participants with depressive symptoms were similar in age, but more likely to be female and African American, less likely to be married, less educated, less likely to own a home, and more likely to smoke. Although all participants were initially employed with an annual income of at least $25000, participants with depressive symptoms were more likely to have a history of unemployment during the prior 3 years and marginally less likely to be employed full time (vs part time) than those without substantial depressive symptoms. Participants with depressive symptoms also reported lower initial annual income than those without substantial depressive symptoms. There were no differences in alcohol use or in number of persons in the household between participants with and without substantial depressive symptoms.

By 1995-1996, 2031 participants (87%) were available for follow-up, including 1906 with income and employment follow-up data available, 29 with employment data only, and 96 with income data only. Of these 2031, 377 (19%) had depressive symptoms in 1990-1991, compared with 62 (20%) of the 303 participants who were unavailable for follow-up (P=.40).

UNEMPLOYMENT

Thirty-three percent (118/354) of participants who had depressive symptoms (CES-D score ≥16) and 21% (335/1581) of participants who did not have substantial depressive symptoms were similar in age, but more likely to be female and African American, less likely to be married, less educated, less likely to own a home, and more likely to smoke. Although all participants were initially employed with an annual income of at least $25000, participants with depressive symptoms were more likely to have a history of unemployment during the prior 3 years and marginally less likely to be employed full time (vs part time) than those without substantial depressive symptoms. Participants with depressive symptoms also reported lower initial annual income than those without substantial depressive symptoms. There were no differences in alcohol use or in number of persons in the household between participants with and without substantial depressive symptoms.

Table 1. Characteristics of 2334 CARDIA Participants Who Were Employed With Income of At Least $25 000 in 1990-1991

<table>
<thead>
<tr>
<th>Variable</th>
<th>With Substantial Depressive Symptoms (n = 439)</th>
<th>Without Substantial Depressive Symptoms (n = 1895)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>30.5 ± 3.5</td>
<td>30.7 ± 3.3</td>
</tr>
<tr>
<td>Female†</td>
<td>61</td>
<td>50</td>
</tr>
<tr>
<td>Ethnicity†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>46</td>
<td>37</td>
</tr>
<tr>
<td>White</td>
<td>54</td>
<td>63</td>
</tr>
<tr>
<td>Married†</td>
<td>41</td>
<td>55</td>
</tr>
<tr>
<td>Education, y†</td>
<td>14.6 ± 2.5</td>
<td>15.1 ± 2.3</td>
</tr>
<tr>
<td>Annual family income, $†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 000-34 999</td>
<td>38</td>
<td>29</td>
</tr>
<tr>
<td>35 000-49 999</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>50 000-74 999</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>≥75 000</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>History of unemployment during past 3 y†</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Current employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>87</td>
<td>90</td>
</tr>
<tr>
<td>Part-time</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Home ownership‡</td>
<td>54</td>
<td>59</td>
</tr>
<tr>
<td>No. of persons in the household</td>
<td>2.6 ± 1.5</td>
<td>2.6 ± 1.3</td>
</tr>
<tr>
<td>Current smoking‡</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>No. of current drinks per week</td>
<td>3.9 ± 6.4</td>
<td>4.0 ± 7.3</td>
</tr>
<tr>
<td>Social network adequacy score†</td>
<td>2.5 ± 0.5</td>
<td>2.8 ± 0.5</td>
</tr>
</tbody>
</table>

*Values are mean ± SD or percentages. CARDIA indicates Coronary Artery Risk Development in Young Adults.
†P<.01.‡P<.05.
pressive symptoms in 1990-1991 reported new unemployment between 1990-1991 and 1995-1996 (Figure 1). The proportion of participants who reported new unemployment ranged from 16% among those who had a depression score lower than 4 (lowest quintile) to 33% among those who scored 16 or higher (highest quintile) in 1990-1991. A consistent increase across quintiles in risk of subsequent unemployment was confirmed by P<.001 for trend (Figure 2).

In bivariate analyses, predictors of new unemployment were depressive symptoms; being younger, female, African American, or unmarried; having less education, less initial income, a history of unemployment, or current part-time (vs full-time) employment; not owning a home; currently smoking; and having poor social network adequacy (Table 2). Number of persons in the household and alcohol use were not associated with an increased risk of subsequent unemployment.

Participants with depressive symptoms in 1990-1991 had a 90% increased odds of subsequent unemployment between 1990-1991 and 1995-1996 compared with participants without substantial depressive symptoms (OR, 1.9; 95% CI, 1.4-2.4; P<.001). This association remained strong after adjusting for potential confounding variables (Table 2). Further adjustment for change in number of persons in the household between 1990-1991 and 1995-1996 did not affect these results.

When we analyzed the association between depression score (as a continuous variable) and subsequent unemployment among all participants, each 7.4-point (SD) increase in depression score was associated with a 30% increase in the odds of subsequent unemployment (OR, 1.3; 95% CI, 1.1-1.4; P<.001), adjusted for marital status, education, part-time (vs full-time) employment, smoking, and social network adequacy. After multivariate adjustment, we observed an association between depressive symptoms and subsequent unemployment in all

<table>
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<tbody>
<tr>
<td></td>
<td>Unadjusted (n = 1935)</td>
<td>Adjusted (n = 1930)</td>
</tr>
<tr>
<td>Depressive symptoms†</td>
<td>1.9 (1.4-2.4)</td>
<td>1.6 (1.2-2.0)</td>
</tr>
<tr>
<td>Age (per year increase)</td>
<td>1.0 (0.9-1.0)</td>
<td>...</td>
</tr>
<tr>
<td>Female</td>
<td>1.3 (1.0-1.6)</td>
<td>...</td>
</tr>
<tr>
<td>African American</td>
<td>1.3 (1.1-1.6)</td>
<td>...</td>
</tr>
<tr>
<td>Married</td>
<td>0.6 (0.5-0.8)</td>
<td>0.7 (0.6-0.9)</td>
</tr>
<tr>
<td>Education (per 2.3-y increase)</td>
<td>0.8 (0.7-0.9)</td>
<td>0.8 (0.7-0.9)</td>
</tr>
<tr>
<td>Income (per category decrease)</td>
<td>1.3 (1.1-1.4)</td>
<td>...</td>
</tr>
<tr>
<td>History of unemployment during past 3 y</td>
<td>4.1 (3.1-5.4)</td>
<td>3.5 (2.7-4.7)</td>
</tr>
<tr>
<td>Full- or part-time employment</td>
<td>0.4 (0.3-0.5)</td>
<td>0.5 (0.3-0.6)</td>
</tr>
<tr>
<td>Home ownership</td>
<td>0.7 (0.6-0.9)</td>
<td>...</td>
</tr>
<tr>
<td>No. of persons in the household (per 1 increase)</td>
<td>1.1 (1.0-1.1)</td>
<td>...</td>
</tr>
<tr>
<td>Current smoking</td>
<td>1.7 (1.4-2.2)</td>
<td>1.4 (1.1-1.8)</td>
</tr>
<tr>
<td>No. of current drinks per week (per 7-drink increase)</td>
<td>1.1 (0.9-1.2)</td>
<td>...</td>
</tr>
<tr>
<td>Social network adequacy (per 1-point increase)</td>
<td>0.7 (0.5-0.8)</td>
<td>...</td>
</tr>
</tbody>
</table>

*Data are given as odds ratio (95% confidence interval). Ellipses indicate not applicable. Adjusted values are based on backwards elimination logistic regression model including all variables in Table 1. Variables associated with new low family income or unemployment were retained in the adjusted models.

†Score of ≥16 on the Center for Epidemiologic Studies Depression scale.

Table 3. Adjusted Risk of Subsequent Unemployment and Low Family Income (<$25 000) Associated With Depressive Symptoms During 5 Years of Follow-up in 4 Ethnicity and Sex Subgroups

| Subgroup | Adjusted Odds Ratio (95% Confidence Interval) stressful symptoms in 1990-1991 reported new unemployment between 1990-1991 and 1995-1996 (Figure 1). The proportion of participants who reported new unemployment ranged from 16% among those who had a depression score lower than 4 (lowest quintile) to 33% among those who scored 16 or higher (highest quintile) in 1990-1991. A consistent increase across quintiles in risk of subsequent unemployment was confirmed by P<.001 for trend (Figure 2).

In bivariate analyses, predictors of new unemployment were depressive symptoms; being younger, female, African American, or unmarried; having less education, less initial income, a history of unemployment, or current part-time (vs full-time) employment; not owning a home; currently smoking; and having poor social network adequacy (Table 2). Number of persons in the household and alcohol use were not associated with an increased risk of subsequent unemployment.

Participants with depressive symptoms in 1990-1991 had a 90% increased odds of subsequent unemployment between 1990-1991 and 1995-1996 compared with participants without substantial depressive symptoms (OR, 1.9; 95% CI, 1.4-2.4; P<.001). This association remained strong after adjusting for potential confounding variables (Table 2). Further adjustment for change in number of persons in the household between 1990-1991 and 1995-1996 did not affect these results.

When we analyzed the association between depression score (as a continuous variable) and subsequent unemployment among all participants, each 7.4-point (SD) increase in depression score was associated with a 30% increase in the odds of subsequent unemployment (OR, 1.3; 95% CI, 1.1-1.4; P<.001), adjusted for marital status, education, part-time (vs full-time) employment, smoking, and social network adequacy. After multivariate adjustment, we observed an association between depressive symptoms and subsequent unemployment in all 4 ethnicity and sex subgroups, although the association in these smaller groups was not statistically significant at the P<.05 level (Table 3).

LOW FAMILY INCOME

Seventeen percent (62/371) of participants who had depressive symptoms (CES-D score ≥16) and 7% (113/1631) of participants who did not have substantial depressive symptoms in 1990-1991 reported new low family income (<$25 000) in 1995-1996 (Figure 1). The proportion of participants who reported new low family income ranged from 6% in those who had a depression score lower than 4 (lowest quintile) in 1990-1991 to 17% in

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those who scored 16 or higher (highest quintile). A consistent increase across quintiles in subsequent risk of low family income was confirmed by \( P < .001 \) for trend (Figure 2). The most marked increase was for the highest quintile, which coincided with our cutpoint for depressive symptoms (CES-D score \( \geq 16 \)).

In bivariate analyses, predictors of new low family income (<$25000) were depressive symptoms; being younger, African American, or unmarried; having less education, less initial income, a history of unemployment, or current part-time (vs full-time) employment; not owning a home; reporting a greater number of persons in the household; currently smoking; and having poor social network adequacy (Table 2). Female sex and alcohol use were not associated with subsequent low family income.

Participants with depressive symptoms in 1990-1991 had a 2.7-fold increased odds of subsequent low family income in 1995-1996 compared with participants without substantial depressive symptoms (OR, 2.7; 95% CI, 1.9-3.8; \( P < .001 \)). This association remained strong after adjusting for potential confounding variables (Table 2). Further adjustment for unemployment occurring between 1990-1991 and 1995-1996 did not affect these results. Likewise, adjustment for change in number of persons in the household between 1990-1991 and 1995-1996 did not affect this association.

When we analyzed the association between depression score (as a continuous variable) and subsequent low family income, each 7.3-point (SD) increase in depression score was associated with a 20% increase in the odds of subsequent low family income (OR, 1.2; 95% CI, 1.1-1.4; \( P = .007 \)), adjusted for ethnicity, marital status, education, initial income, part-time (vs full-time) employment, number of persons in the household, and current smoking.

Although the 4 ethnicity and sex subgroups had roughly equal numbers at the initial recruitment, our study had fewer African American men and women because of the exclusion criteria of unemployment or low family income. The association between depressive symptoms and subsequent low family income was present in all 4 ethnicity and sex subgroups, although the association in these smaller groups was statistically significant at the \( P < .05 \) level only for African American men (Table 3).

**SYMPTOMS OF DEPRESSION AT INITIAL AND FOLLOW-UP EXAMINATIONS**

Of the 368 (employed and income \( \geq $25000 \)) participants with depressive symptoms at the initial examination (1990-1991) for whom follow-up data and depression scores were available 5 years later, 155 (42%) also had depressive symptoms in 1995-1996. Participants with depressive symptoms at both examinations were more likely to report low family income in 1995-1996, compared with participants who had depressive symptoms at the initial examination only (adjusted OR, 1.8; 95% CI, 1.0-3.4; \( P = .05 \)). However, participants with depressive symptoms at both examinations were no more likely to report interim unemployment than those with depressive symptoms only at the initial examination (adjusted OR, 0.9; 95% CI, 0.6-1.6; \( P = .80 \)).

**COMMENT**

Depressive symptoms were associated with a 60% increased adjusted odds of subsequent unemployment and a 90% increased adjusted odds of decreased family income (<$25000) during 5 years of follow-up among young to middle-aged adults who were employed and reported an annual family income of at least $25000 at the outset. Other predictors of subsequent unemployment and income loss included having a history of unemployment; being unmarried, less educated, or part-time (vs full-time) employed; and cigarette smoking. Our results may have been affected by unmeasured confounding variables, such as poor job performance before the initial examination. However, after adjusting for relative differences in baseline employment and income level among the initially employed young adults with higher income who were included in this study, we found that depression was a predictor of subsequent unemployment and low family income 5 years later.

Although the causal pathways almost certainly go both ways, the results of our study support the hypothesis that depressive symptoms lead to decrements in socioeconomic status. Several potential mechanisms may explain the association between depressive symptoms, loss of income, and unemployment. Depression can lead to impaired job performance, absenteeism, or tardiness at the workplace; a reduction in work hours; or a change to a new position.22-24 Loss of productivity due to low achievement and reduced effectiveness at work may result in diminished compensation. Young adults with depressive symptoms may also be more vulnerable to loss of employment during periods of economic downturn than those who are not depressed. Finally, depressive symptoms may be associated with decreased family income by virtue of their effect on other members of the household.

Participants with depressive symptoms at the initial (1990-1991) and follow-up (1995-1996) examinations were more likely to report loss of family income (but not new unemployment) than those with depressive symptoms at the initial examination only. Because depression and loss of income may be mutually reinforcing, we cannot determine whether the presence of depressive symptoms at follow-up was a cause or result of decreased family income. However, several treatment trials have found that alleviating symptoms of depression may lead to better work performance.

A study compiling data from 827 patients in 10 treatment trials found that remission of depression was associated with better work outcomes and that relapse was associated with a return of work impairment.2 Another study of 493 participants enrolled in a randomized trial of 2 antidepressant medications found that improved depression scores were associated with increased self-perceived work performance during 12 weeks of follow-up.3,4 A third study examining longitudinal data collected...
from 171 patients treated for depression found that aggressive treatment (pharmacological and nonpharmacological) was associated with less self-reported work absenteeism during 12 months of follow-up.3

A fourth study of 290 patients enrolled in a randomized trial of antidepressant therapy found that those with clinical improvement at 12 months were more likely to maintain paid employment and reported fewer days missed from work because of illness.6 Finally, a randomized trial comparing quality improvement programs with usual care in 1356 patients with depression found that more intensive treatment of depression (including frequent nursing follow-up or cognitive behavioral therapy) was associated with increased employment at 12 months of follow-up.7 Therefore, taken together with the results from previous studies, our data are consistent with the hypothesis that alleviating symptoms of depression may lead to better work performance and compensation.25

The association of depression with loss of family income and unemployment may reach far beyond the burden of economic hardship. Low socioeconomic status has been associated with impaired physical, psychological, and social functioning26; coronary heart disease risk factors27; incident coronary heart disease28,29; and mortality.30,31 Low socioeconomic status may act as a mediator in the pathways between depressive symptoms and poor health outcomes, including functional decline, medical illness, disability, and mortality.32 Conversely, because low socioeconomic status is itself a risk factor for depression,33 depressive symptoms may act as a mediator between low socioeconomic status and poor health, or the causal pathways may be bidirectional.

The loss of family income and unemployment associated with depressive symptoms may have implications for the lifetime productivity and earnings of many young adults. We found that 19% of study participants had depressive symptoms (CES-D score ≥16) in 1990-1991. In the National Institute of Mental Health Epidemiological Catchment Area study, 10% of the general population had current depressive symptoms.34 In the National Comorbidity Survey, another large epidemiological study of psychiatric illness, 17% of young to middle-aged community-dwelling adults had major depression during their lifetime, and 5% had current major depression,35 defined as having at least 5 of 9 possible symptoms of depression for 2 or more weeks.36 An additional 3% to 16% of medical outpatients have minor depression (depressive symptoms without clinical depression), defined as having 2 or 3 symptoms of depression for 2 or more weeks.37 However, despite the availability of effective therapy, less than half of depressed patients receive adequate treatment,41,42 and more than 80% of untreated patients experience at least 1 recurrence of depression.43 Therefore, if our findings are extrapolated to the lives of the many young adults who have this disorder, depressive symptoms may have serious economic consequences.

Several methodological issues should be considered when interpreting our results. First, we measured annual family income rather than personal job earnings as the outcome variable. Family income not only reflects personal job earnings but also property and investment income, as well as other personal income, unemployment compensation, Social Security, disability payments, and welfare payments received by the participant and other members of the household.32 Second, we were unable to account for past or current mental health treatment, including use of antidepressants, or for history of other mental health disorders. Third, we were unable to assess whether depressive symptoms may have been related to participants' knowing that they were at risk of losing their jobs. Finally, self-reported income in both groups may be less accurate than objective evidence derived from pay stubs or tax returns.

In conclusion, depression is a common, serious, easily diagnosed, and treatable disease.45 We found that depressive symptoms are associated with subsequent loss of family income and unemployment among working young adults. Although it is impossible for any observational study to entirely exclude confounding, we believe that our longitudinal study design, the dose-response relation, and the consistency of our findings across both outcomes strongly support the hypothesis that depressive symptoms lead to decrements in socioeconomic status. This decline in socioeconomic status should be considered when estimating the cost of untreated depression.

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From the Department of Veterans Affairs Medical Center (Dr Whooley), and Departments of Medicine (Drs Whooley and Chesney) and Epidemiology and Biostatistics (Drs Whooley and Hulley), University of California, San Francisco; Center for Outcomes and Effectiveness Research and Education (Dr Kiefe), and Division of Preventive Medicine, Department of Medicine (Drs Kiefe and Markovitz), The University of Alabama at Birmingham, and Department of Veterans Affairs Medical Center (Drs Kiefe and Markovitz), Birmingham, Ala; and Department of Psychiatry, University of Pittsburgh, Pittsburgh, Pa (Dr Matthews).

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Corresponding author and reprints: Mary A. Whooley, MD, Department of Veterans Affairs Medical Center, 4150 Clement St (Mail Stop 111A1), San Francisco, CA 94121 (e-mail: whooley@itsa.ucsf.edu).

REFERENCES

3. Finkelstein SN, Berndt ER, Greenberg PE, Parsley RA, Russell JM, Keller MB, for
the Chronic Depression Study Group. Improvement in subjective work performance after treatment of chronic depression: some preliminary results. 


