DOI: 10.1111/j.1475-6773.2007.00782.x
RESEARCH ARTICLE

Mental Health and the Life Span

Depression and Retirement in Late Middle-Aged U.S. Workers

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Objective. To determine whether late middle-aged U.S. workers with depression are at an increased risk for retirement.

Data Source. Six biennial waves (1992–2002) of the Health and Retirement Study, a nationally representative panel survey of noninstitutionalized 51–61-year-olds and their spouses started in 1992.

Study Design. Workers aged 53–58 years in 1994 were followed every 2 years thereafter, through 2002. Depression was coded as lagged time-dependent variables measuring active depression and severity of depression. The main outcome variable was a transition to retirement which was measured using two distinct definitions to capture different stages in the retirement process: (1) Retirement was defined as a transition out of the labor force in the sample of all labor force participants ($N = 2{,}853$); (2) In addition a transition out of full time work was used as the retirement definition in the subset of labor force participants who were full time workers ($N = 2{,}288$).

Principal Findings. In the sample of all labor force participants, the presence of active depression significantly increased the hazard of retirement in both late middle-aged men (adjusted OR: 1.37 [95 percent CI 1.05, 1.80]) and women (adjusted OR: 1.40 [95 percent CI 1.10, 1.78]). For women, subthreshold depression was also a significant predictor of retirement. In the sample of full time workers, the relationship between depression and retirement was considerably weaker for women yet remained strong for men.

Conclusions. Depression and depressive symptoms were significantly associated with retirement in late middle-aged U.S. workers. Policymakers must consider the potentially adverse impact of these labor market outcomes when estimating the cost of untreated depression and evaluating the value of interventions to improve the diagnosis and treatment of depression.

Key Words. Depression, depressive symptoms, retirement, labor force, labor market

BACKGROUND

Depression is a prevalent chronic condition which often leads to increased morbidity and functional impairment (Penninx et al. 2000). With 9 percent of

all U.S. adults in the labor force estimated to suffer a bout of major depression in a 12-month period (Marcotte, Wilcox-Gok, and Redmon 1999), over half of the burden of this disease (estimated to be US$ 82 billion in 1998) can be attributed to work impairment, disability, and absence (Berto et al. 2000; Greenberg et al. 2003; Stewart et al. 2003). Despite the wide availability of effective and cost-effective treatments for depression, there is poor penetration of adequate treatment to those likely to reap its benefits. Improving our understanding of the burden of depression may be an effective way to improve treatment rates.

While researchers have extensively studied various social and economic consequences of depression, its impact on labor force participation outcomes in U.S. workers, and older workers in particular, has received little attention. Studies suggest that depression may lead to a reduction in job attachment among young working adults through subsequent unemployment (Whooley et al. 2002) or higher job turnover among those who remain employed (Lerner et al. 2004). The few studies that have examined the impact of depression or depressive symptoms on labor force outcomes in late middle-aged workers are inconclusive for the U.S. labor market. For older Finnish male workers, Karpansalo et al. (2005) found that depression was associated with the risk of early retirement or disability pensions. For older U.S. workers, Emptage, Sturm, and Robinson (2005) found no differences in employment outcomes between patients who were depressed with no pain or patients depressed with mild to moderate pain as compared with those with no depression and no pain. Only the small group of workers with depression plus severe pain had a lower probability of remaining in the labor force as compared with the group with no depression or pain. The independent influence of depression was not explored.

The objective of this paper is to examine the increase in risk of retirement due to depression among 53–58-year-old men and women followed over an 8-year period. Using the Health and Retirement Study (HRS), a prospective, longitudinal, nationally representative survey of late middle-aged U.S. adults, we test the hypothesis that individuals with significant depressive

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symptoms would be more likely to retire than individuals without depressive symptoms.

Conceptual Framework

A decline in health, including occurrence of depression, affects labor supply primarily because health and the capability to adequately perform a job are closely related (Grossman 1972). The economic rationale, under the human capital model, is that reductions in health would lower productivity and thus reduce the probability of being employed under prevailing wages. This reduces the employee's earning potential and the opportunity cost of leisure which reduces the incentives for labor force participation. In addition to reduced productivity, declining health may reduce labor supply through a diminished taste for work and increased time required for health maintenance. Theoretically, poor health, including depression, may also have a positive influence on labor force participation. The lower earnings associated with poor health may induce an increase in the need for work to replace lost income, to maintain health insurance, or to pay for the additional health services consumed. Therefore, empirical studies are necessary given that theory cannot predict the direction of the effect of declining health on labor supply (Dwyer and Mitchell 1999).

Any empirical investigation of health and labor supply must not ignore the possibility of a reverse causal relationship. That is, not only does health affect labor supply, but labor supply may affect health. This is implied in the human capital model of health where health maintenance requires both time and material resources. These resources may depend on the individual's labor force status. In addition, labor market activities may also have a direct impact on individual health either through the stress or hazards associated with certain working environments or a deterioration of health from the lack of activity during nonparticipation (Sickles and Taubman 1986; Stern 1989). This latter possibility may be especially relevant for retired workers wherein it has been shown that retirement itself may result in depression (Szinovacz and Davey 2004).

Therefore, the classification of timing and severity of depressive events are essential aspects of an empirical study of the causal relationship between depression and retirement. Our empirical approach, informed by this framework, involves capturing depression status and job status longitudinally, ensuring that depressive events captured occurred before change in job status,

and considering the severity of the depressive symptoms to understand how depression may change labor force participation for workers nearing retirement age. In addition, our empirical models draw from the extensive labor economics literature to control for economic factors such as access to pensions, Social Security payments, and retiree health insurance (RHI) that may potentially bias the relationship between depression and labor force participation (Blinder, Gordon, and Wise 1980; Stock and Wise 1990; Gustman, Mitchell, and Steinmeier 1994; Gruber and Wise 1999, 2004; Rogowski and Karoly 2000).

METHODS

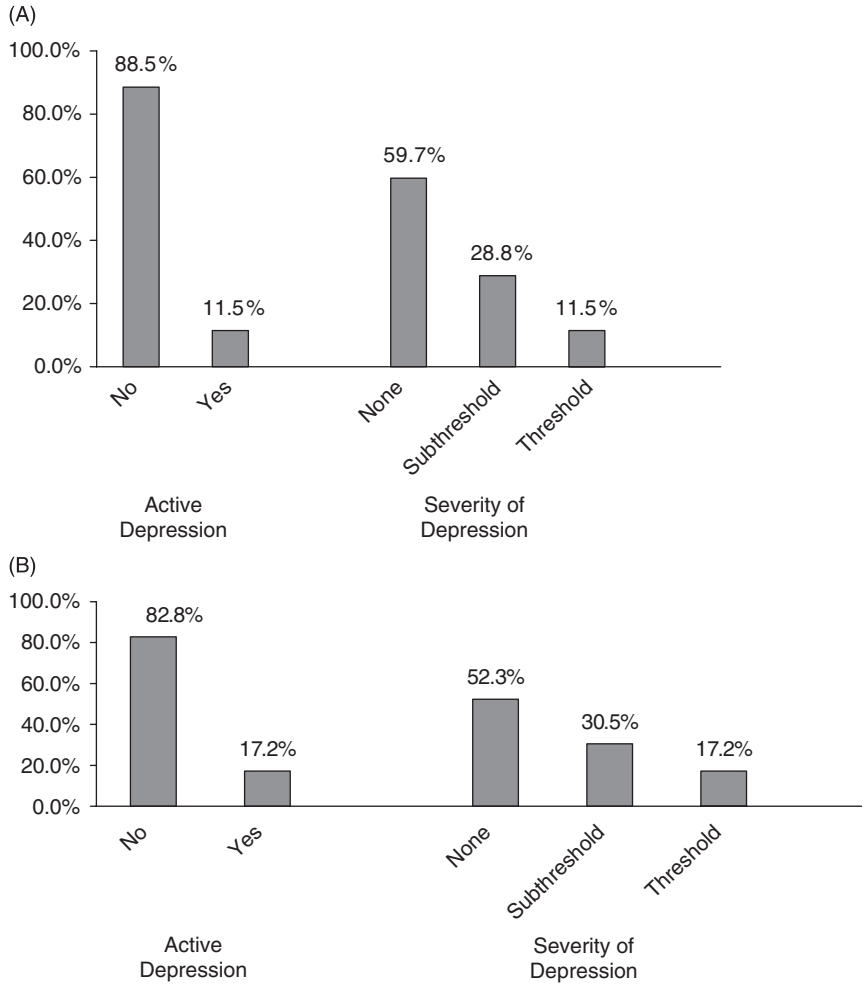
Data

This paper uses the HRS, a nationally representative, longitudinal survey of noninstitutionalized adults in 48 U.S. states who were born during the years 1931 through 1941. An initial sample of 12,652 subjects (9,772 age-eligible and 2,880 nonage-eligible spouses) was drawn in 1992 and interviews were conducted in person. These subjects have been followed prospectively with follow-up telephone interviews every 2 years. The detailed survey sampling procedures have been described elsewhere (Burkhauser and Gertler 1995). This study uses data from six waves of the HRS from 1992 (Wave 1) to 2002 (Wave 6).

We selected subjects aged 53–58 years old and in the labor force in 1994 ($n = 3{,}568$) (Appendix Figure 1). We excluded respondents who reported being self-employed ($n = 612$) and those who either died between 1994 and 1996 or were nonrespondents in survey waves after 1994 ($n = 103$).

Retirement Outcomes. We defined retirement based on the "labor force status" variable in the RAND HRS data files (St. Clair et al. 2004), which summarizes the labor force status for each respondent at each wave into mutually exclusive categories of working full-time, working part-time, unemployed, partly retired, retired, disabled, or not in the labor force. This variable combines HRS survey responses to questions on self reported retirement status, current job status, working for pay, hours work per week, weeks per year usually work, and others to create a consistent labor force status definition. Any discrepancies in responses across these questions are sorted out in its derivation with reports of working and retirement taking precedence over other concurrently reported labor force outcomes (St. Clair et al. 2004).

Figure 1: A. Rates of Depression Status in Primary Sample of Male Labor Force Participants. B. Rates of Depression Status in Primary Sample of Female Labor Force Participants.



For instance, if a person is working full time (defined as 35+ hours per week, 36+ weeks per year based on hours and weeks from main and second job), then he/she is assigned this status. If a person reports working part time or is looking for a part-time job and mentions retirement, then he/she is assigned as partly retired. If a person is working part time and there is no mention of

retirement, their status is set to working part time. Persons who are not working or not looking for work and mention retirement are assigned as retired. Persons who are disabled (as defined by a disability employment status indicator) or unemployed (defined as not working and looking for part or full-time work) are only assigned these categories if they do not report retirement. Otherwise, this variable is set to "not in the labor force" status.

We defined retirement outcomes in this paper to capture different stages in the retirement process (Honig and Hanoch 1985; Honig and Reimers 1987; Ruhm 1990; Quinn 1997). We did this by analyzing two distinct transitions along the retirement continuum: (1) whether one finished the retirement process (i.e., transition to labor force exit) and (2) whether one started the retirement process (i.e., transition to exit full time work). Because we used a longitudinal study design, we needed a different study sample for each outcome in order to follow the population at risk for each transition. Therefore, the study sample for the analysis of the transition to labor force exit consisted of all labor force participants in 1994 ($N = 2{,}853$) (those with labor force status of "retired," "disabled," and "not in labor force" were excluded). The study sample for the analysis of the transition to exit of full time work consisted of the subset of labor force participants who reported to be full-time workers in 1994 ($N = 2{,}288$).

The "retirement" definition defined for transitions out of the labor force includes transitions from working (either full or part time) to either retired or disabled status as identified by the responses on the labor force status variable. While a labor force status of disabled is generally considered a temporary transition, we include it as a transition out of the labor force because we found that 89 percent of individuals with these transitions did not return to the labor force. We believe they may not have responded as being retired at the time of the interview because they intended to return to the labor force.

The "retirement" definition for transitions out of full-time work includes transitions to part-time work/partial retirement and unemployment in addition to full retirement and disability status. These transitions may be considered as intermediate outcomes in the process towards complete retirement in this age group. We considered the transition to unemployment as a move toward retirement because we found that 6 out of 10 in this age group did not return to full time work.

Characterizing Depression Using the HRS. The HRS measures depressive symptoms with a subset of eight items of the standard Center for Epidemiologic Studies Depression scale (CES-D). Respondents were asked

about their depressive affect ("I felt depressed," "I felt lonely," and "I felt sad"), well-being ("I was happy" and "I enjoy life"), and somatic symptoms ("I felt everything I did was an effort," "My sleep was restless," and "I could not get going"). Previous studies have reported that this modification results in little loss of the structure and precision of the original scale (Kohout et al. 1993; Soldo et al. 1997). Participants indicated whether they did or did not experience (Yes/No) each of the eight symptoms much of the time in the past week. All items worded in the positive direction are reverse scored. A summary score was created by summing the number of "yes" answers across the eight items.

This summary score was used to identify depression status. To ensure the temporal relationship between depression and retirement, our depression status measures were lagged and time varying. In other words, the depression status for each individual in our sample was defined in every follow-up survey wave based on their CES-D score in the previous one wave. Two separate lagged time varying measures were created to characterize the presence and severity of depression. First, the presence of active depression was defined using a cut-off point of 3 or more. This cutoff value has been used in previous studies and has been found to have a sensitivity of 71 percent and specificity of 79 percent for major depression (Turvey, Wallace, and Herzog 1999; Han 2002; Emptage, Sturm, and Robinson 2005). Second, three categorical variables were created to designate no depression (CES-D score = 0), subthreshold depression (CES-D = 1–2), and active depression (CES-D score $\geq$ 3). We separated out subthreshold depression as many adults suffer from significant symptoms of depression, not severe enough to be classified as major depression (Broadhead et al. 1990; Unutzer et al. 1997; Beekman et al. 2002), but have been shown to result in increased morbidity and functional impairment among patients (Pincus, Davis, and McQueen 1999).

Other Covariates. Our control variables included a series of sociodemographic factors such as age, race, education, marital status, and geographic region of residence. We also included health factors such as self-reports of medical conditions (cancer, diabetes, hypertension, heart disease, arthritis or rheumatism, lung disease, and stroke) and presence of any activities of daily living (ADL) limitations and instrumental activities of daily living (IADL) limitations.

We captured important economic incentives for retirement such as income and wealth as well as access to RHI, social security, and pensions. Household assets were measured separately in terms of housing value and

nonhousing value as well as personal earnings and the proportion of the annual household income contributed by the individual's annual earnings. We identified whether the respondent currently had employer sponsored health insurance (ESHI) from their own or spouse's employer with or without a RHI offer. For respondents who did not have ESHI, we identified whether they currently had some other health insurance (i.e., Medicaid, Medicare, VA, individually purchased) with or without access to RHI from a previous job. Respondents who had none of the above were coded as having no health insurance. We included a measure of social security eligibility, which is "yes" for those currently receiving benefits or for those who say they expect to receive benefits in the future. We classified respondents as having pension coverage through one or more defined benefit plans, one or more defined contribution plans, both defined benefit and defined contribution plans, one or more plans of unknown type, or having no pension coverage based upon self-reports on up to four plans from current or former employers. The small proportion of respondents who did not know if they had a pension plan were grouped with those who stated they had no plan.

We captured type of occupation and industry because different jobs are associated with different levels of physical and mental stress and may differentially impact labor market decisions. Other job characteristics used as controls include tenure on current job and whether the respondent was working full time or part time in the baseline survey.

With the exception of the sociodemographic factors and job benefits such as social security eligibility and pension type availability, all other covariates were coded as lagged time-dependent variables based on the previous wave.

Analysis. We estimated the unadjusted retirement rates by the two depression status measures. For the multivariate analysis, we used a discrete logistic regression model with time-varying covariates. This model was proposed by Cox (1972) as an extension of the proportional hazards model to discrete time by working with the conditional probability P_{it} that individual i has an event at time t, given that the event has not already occurred to that individual. The model says that P_{it} is related to the covariates by a logistic regression equation: $\log\,(P_{it}/1 - P_{it}) = \alpha_t + \beta_1 x_{it1} + \ldots\ldots\ldots + \beta 1 x_{itk}$. This model is estimated using maximum likelihood rather than the method of partial likelihood used in Cox models (Allison 1995).

The retirement events are modeled at discrete time points based on the survey wave when the subject first reported retirement which could occur 2,

4, 6, or 8 years after 1994. Respondents were considered no longer at risk after their first report of retirement during follow-up. (In this age group, only few [17 percent] who discontinue labor force participation ever return to work.) If death, loss to follow-up, or end of the study period (i.e., 2002) occurred before the event, the subject was considered as censored.

We estimated separate models for the two depression status measures. Unadjusted and adjusted odds ratios for retirement were obtained by estimating the models without and with the covariates, respectively. These analyses were performed for both retirement definitions. Because participation in and attachment to the labor force differ by gender in this age group, our entire analysis was stratified by gender.

All results were weighted using the HRS survey weights and standard errors were adjusted for the complex survey sampling design using the Potthoff, Woodbury, and Manton (1992) method. Because the CES-D items were not asked of proxy respondents, about 12.1 percent of the person-wave observations had a missing value for the CES-D score. For most other covariates the percent of missing observations ranged from 6.4 to 8.0 percent. All missing data were imputed by carrying forward values from the prior wave. Sensitivity analysis indicated no substantial changes in results if missing data were either excluded from the analyses or were imputed by carrying backward values from the next wave.

RESULTS

Table 1 presents the characteristics of the sample of all labor force participants. Both genders are equally represented in this sample. The top panel of the table indicates men were more likely to be full-time workers than women. On the other hand, women were over three times more likely to be part-time workers than men (24.0 versus 7.3 percent). The proportion of respondents who reported being unemployed at baseline was similar and less than 5 percent in both groups. The large differences between men and women in the probability of full-time work make it necessary to explore retirement transitions separately by gender. Additionally, because fewer women participate in the labor force as full-time workers, the separate analysis of all labor force participants and full-time workers should be more revealing for women. The differences in wages and job benefits in the second panel of the table provide further evidence of the need for a stratified analysis by gender. Men were more likely to be in jobs with higher weekly wages and more likely to offer postretirement health benefits.

Table 1: Characteristics of Sample of All Labor Force Participants

Characteristics	*Men (%)*	*Women (%)*
Baseline sample size	$N = 1,430$	$N = 1,423$
Full-time workers	88.9	71.5
Part-time workers	7.3	24.0
Unemployed	3.8	4.5
Person-wave observations	$N = 4,552$	$N = 4,418$
Age (years)		
55–56	12.5	12.8
57–58	22.0	21.3
59–60	27.1	27.4
61–62	23.0	22.1
63–64	11.2	11.8
65–66	4.1	4.4
Race/ethnicity		
White	83.8	80.8
Black	7.2	11.4
Hispanic	6.6	6.0
Other	2.4	1.9
Marital status		
Married	86.5	63.5
Single	9.4	21.5
Divorce/separated	2.5	3.9
Widow	1.5	11.1
Education		
High school dropout	16.6	14.6
High school graduate	35.7	42.0
Some college	21.8	23.5
College graduate	25.9	19.9
Medical conditions		
Cancer	3.8	8.3
Stroke	2.0	1.4
Diabetes	9.9	6.7
Arthritis	33.5	44.2
Hypertension	37.9	33.5
Chronic lung disease	5.1	5.3
Heart disease	13.5	7.2
Activity of daily living limitations		
0	96.3	96.0
1 or more	3.7	4.0
Instrumental activity of daily living limitations		
0	97.0	97.6
1 or more	3.0	2.4
Housing value		
$0 or less	15.3	18.6
$1–$50 k	27.8	28.0
$50 k–$150 k	44.4	40.8
More than $150 k	12.5	12.6

continued

Table 1: *Continued*

Characteristics	*Men (%)*	*Women (%)*
Nonhousing value		
Less than 0	4.5	5.2
$0–$10 k	15.0	20.5
$10 k–$50 k	25.1	24.1
$50 k–$100 k	17.5	15.1
$100 k–$200 k	15.5	14.6
More than $200 k	22.4	20.5
Weekly wage, %		
$300 or less	16.8	38.7
$300–$500	18.4	29.1
$500–$800	26.3	19.7
$800–$1,500	29.5	10.6
More than $1,500	9.0	1.9
Health insurance benefits*		
ESHI with RHI	48.4	32.8
ESHI without RHI	29.9	27.1
Other HI, No ESHI (with RHI)	6.8	15.6
Other HI, No ESHI (without RHI)	8.9	15.5
No HI	6.1	8.9
Social security eligibility		
Yes	85.3	73.3
No	4.7	6.7
Type of pension availability		
Defined benefits	27.3	27.9
Defined contribution	24.5	22.3
Defined benefits and contribution	25.2	14.6
None/unknown	23.0	35.2

Note: *ESHI, employer-sponsored health insurance; RHI, retiree health insurance; HI, health insurance.

Figures 1A and B present the prevalence rates of depression in the samples of all labor force participants among men and women, respectively. As expected, the prevalence of active depression was higher in women (17.2 percent) than men (11.5 percent). In both groups, the prevalence of subthreshold depression was about 30 percent.

Table 2 presents rates of retirement by depression status. The rates of retirement, overall and type of retirement, for all labor force participants are displayed in the top half of the table. For this sample, active depression status was significantly associated with retirement among both men and women. In both men and women, the results were primarily driven by the higher incidence of full retirement among respondents with active depression than those without active depression (19.4 versus 13.2 percent in men; 19.3 versus 14.4

Table 2: Retirement Rates by Depression Status

	Men					*Women*				
			Type of Retirement					*Type of Retirement*		
Depression Status	*N*	*Retired %*	*Fully Retired%*	*Partially Retired* %*	*Disabled %*	*N*	*Retired %*	*Fully Retired%*	*Partially Retired*%*	*Disabled %*
All labor force participants										
Active depression[†]										
No	3,989	14.2	13.2	–	1.0	3,595	15.2	14.4	–	0.8
Yes	563	21.7**	19.4**	–	2.3**	823	21.3**	19.3**	–	2.0**
Severity of depression[‡]										
None	2,598	13.1	12.5	–	0.7	2,228	13.6	13.2	–	0.4
Subthreshold	1,391	16.4**	14.8**	–	1.6**	1,367	18.0**	16.5	–	1.5**
Active	563	21.7**	19.4**	–	2.3**	823	21.3**	19.3**	–	2.0**
Full-time workers										
Active depression										
No	3,315	19.9	12.5	6.7	0.7	2,312	23.1	12.5	10.0	0.6
Yes	425	28.0**	15.8**	9.5	2.8**	515	29.1**	18.8**	9.1	1.2
Severity of depression[‡]										
None	2,172	19.3	11.5	7.2	0.6	1,469	22.0	12.3	9.4	0.3
Subthreshold	1,143	21.3	14.6	5.6	1.1	843	24.9	13.6	10.5	0.8
Active	425	28.0**	15.8**	9.4	2.8**	515	27.9**	17.0**	9.5	1.4

*Includes respondents who reported becoming partially retired, part-time working, or unemployed.

**Significantly different at 0.05 level from the no depression group.

[†]No, CESD score < 3; yes, CESD score ≥ 3.

[‡]None, CESD score $= 0$; subthreshold, CESD score $= 1$–2; active, CESD score ≥ 3.

percent in women). There were also significant differences in transitions to disability by whether the respondent had active depression status or not (2.3 versus 1.0 percent in men; 2.0 versus 0.8 percent in women). We also observed a dose–response relationship in terms of the impact of depression severity on retirement. For instance, 13.1 percent of men with no depression retired, followed by 16.4 percent of those with subthreshold depression, and 21.7 percent of those with active depression.

A similar pattern of differences (albeit, not always significant) was observed in the incidence of retirement defined in the full-time worker sample. These retirement rates are displayed in the bottom half of Table 2. The overall absolute incidence rates were much higher in this subgroup because, by including transitions to partial retirement, this is a broader definition of retirement. In general, while full-time working women are more likely to transition to partial retirement than men, depression does not increase the likelihood of transitioning to partial retirement for women nor for men. Again, the overall results were mainly driven by the differences in the incidence rates of full retirement by depression status.

Table 3 presents the unadjusted and adjusted odds ratios for retirement by each depression status measure (see Table A1 for coefficients on all other covariates from the discrete logistic regression model using the active depression status [yes/no] measure). The unadjusted odds ratios represent the same information as the differences in raw incidence rates by depression status presented in Table 2. We first consider the multivariate results in the sample of all labor force participants displayed in the top half of the table. Men participating in the labor force had significantly higher adjusted odds of retiring if they had active depression (OR 1.40 [95 percent CI 1. 07–1.84]). However, the odds of retirement in men with subthreshold depression were no different than those with no symptoms. Women in the labor force had 38 percent higher odds of retiring in the presence of active depression (OR 1.38 [95 percent CI 1.08–1.76]). Women with subthreshold depression were significantly more likely to retire than women with no depression (OR 1.30 [95 percent CI 1.05–1.62]). In contrast to the men, covariate adjustment had little influence in reducing the magnitude of the unadjusted odds ratios in the sample of women labor force participants.

In the sample of full-time workers, the results for men are nearly identical to those when the sample consisted of all labor force participants. Given that most male labor force participants in this age group are indeed full time workers and that few choose part-time work as a part of their retirement process, the similar findings are not surprising. However, for women, this

Table 3: Odds Ratios for Retirement* by Depression Status

	Men				*Women*			
Depression Status	*Unadjusted Odds Ratio*	*(95% CI)*	*Adjusted Odds Ratio*	*(95% CI)*	*Unadjusted Odds Ratio*	*(95% CI)*	*Adjusted Odds Ratio*	*(95% CI)*
All labor force participants								
Active depression†								
No	1.00		1.00		1.00		1.00	
Yes	1.66**	(1.31, 2.10)	1.40**	(1.07, 1.84)	1.46**	(1.17, 1.81)	1.38**	(1.08, 1.76)
Severity of depression‡								
None	1.00		1.00		1.00		1.00	
Subthreshold	1.35**	(1.11, 1.64)	1.23	(0.99, 1.51)	1.31**	(1.07, 1.61)	1.30**	(1.05, 1.62)
Active	1.85**	(1.44, 2.37)	1.53**	(1.15, 2.04)	1.62**	(1.29, 2.05)	1.56**	(1.20, 2.03)
Full-time workers								
Active depression†								
No	1.00		1.00		1.00		1.00	
Yes	1.55**	(1.21, 1.99)	1.38**	(1.04, 1.82)	1.29**	(1.01, 1.64)	1.18	(0.90, 1.54)
Severity of depression‡								
None	1.00		1.00		1.00		1.00	
Subthreshold	1.09	(0.90, 1.32)	1.02	(0.83, 1.26)	1.14	(0.91, 1.42)	1.17	(0.92, 1.48)
Active	1.60**	(1.24, 2.07)	1.39**	(1.04, 1.86)	1.35**	(1.04, 1.75)	1.26	(0.94, 1.68)

*Defined as fully retired or disabled in sample of labor force participants; fully retired, partially retired or disabled in sample of full-time workers and fully retired in the sample of full-time workers to fully retired.

**Significance at 0.05 level.

†No, CESD score < 3; yes, CESD score ≥ 3.

‡None, CESD score $= 0$; subthreshold, CESD score $= 1$–2; active, CESD score ≥ 3.

retirement definition more fully captures their distinctive relationship to the labor force; it removes the large number of female part-time workers from the sample of labor force participants and it considers the transition to part-time work—a popular transition for women—as a retirement outcome. The relationship between depression and retirement is much weaker in full-time working women than for all women in the labor force. This is indicated by the considerably lower odds ratios across all definitions of depression symptoms and the lack of significance after adjustment of covariates. As this definition of workers excludes those working part time, the nonsignificant results for women imply that the females most likely to retire as a result of depression symptoms are the part time workers and the significantly higher odds ratios for women in the sample of all labor force participants are a result of the inclusion of the large proportion of part time workers in that group.

Discussion

This longitudinal study finds that the presence of depression has a significant impact on labor force participation in late middle-aged men and women. As hypothesized, we found that the presence of active depression significantly increased the risk of retirement in both men and women. For men, this increased risk exists for both a transition to complete retirement in all labor force participants as well as not working full time in the full-time workers. However, for women, the effect of depression on retirement transitions was concentrated among those working part time rather than full time. In addition, we found that besides active depression, subthreshold depression was also predictive of retirement although this finding did not reach statistical significance in men.

Our finding that even a low or subthreshold level of depression increases the risk of retirement in women adds to the growing literature on the clinical, economic, and public health significance of subthreshold depressions which are more prevalent than major depressive disorders (Judd, Schettler, and Akiskal 2002). The lack of a statistically significant finding in men highlights the differences in the relationship of gender with both, depression and labor force attachment. The lack of significant findings in the sample of full-time working women may be because of selection effects given that women who are still working full-time in their late middle age may be very different in their degree and reasons of job attachment (for example, lack of accumulated savings or the need for affordable access to health insurance for depression treatment).

In terms of the specific labor market outcomes, we found that depressed workers were more likely to fully retire than nondepressed workers. The risk of a transition to disability also significantly increased in the presence of active depression status. While disability benefits may provide some relief to the small percentage of disabled workers, earlier retirement among most other workers may result in loss of income and potentially access to the highly valued employer-sponsored health insurance. While in our primary analysis our baseline cohort of 53–58-year-old workers could reach the age of 61–66 years at the 8-year follow-up interview (i.e., 2002), post hoc analyses truncating follow-up at earlier interview waves wherein the cohort would only reach age ranges of 59–64 (i.e., 6-year follow-up) or 57–62 years (i.e., 4-year follow-up) demonstrated similar results (see Tables A2 and A3, respectively). The primary concern raised by these findings relates to the increase in risk of an early retirement due to depression. This may adversely impact the financial well-being and access to health care of these depressed workers, given that most would not qualify for Social Security benefits until 62 and Medicare until the age of 65. In particular, health insurance would be critical to most people's ability to afford medical services, including mental health services related to depression (Landerman et al. 1994; McAlpine and Mechanic 2000). Otherwise, given that catastrophic medical events are quite common at this older age (French and Jones 2004), a substantial amount of the individual's retirement savings may be required to pay for the health care expenditures incurred while uninsured. While some workers may have access to early RHI, recent trends among employers increasingly scaling-back or dropping retire health benefits for new retirees will clearly limit this avenue in the future (Kaiser/Hewitt 2004). Furthermore, obtaining individual or public health insurance will require financial ability to afford coverage or the ability to qualify for coverage, respectively. Hence, in addition to financial hardship, earlier retirement as a result of depression may potentially have far reaching detrimental effects on the health of late middle-aged workers.

Our results must be interpreted in light of the following limitations. First, subjects may have had episodes of significant depressive symptoms between the biennial interviews that were also resolved in the period. A related limitation pertains to the fact that the survey did not adequately capture data on the use and success of antidepressant treatment and psychological counseling. If some workers observed with depression were managed with depression treatment to the point where a retirement transition was avoided then our results would underestimate the impact of untreated depression on labor force outcomes. Another limitation pertains to potential for selection bias if workers

with a history of depression are prone to select into jobs with better retirement benefits from which they can retire early. However, this is unlikely as inclusion or exclusion of variables on availability of future pension and RHI benefits did not significantly change our results. Finally, it is possible that for some workers the job related stress itself may play a role in triggering the onset of depressive illness and hence leaving that job as a result may not necessarily be a negative labor force outcome from the perspective of the worker.

Overall, our study is among the first to show that in addition to negative medical and social consequences, depression and depressive symptoms may also have a significant impact on retirement in late middle-aged U.S. workers. In light of our findings, it is of concern that major depression and significant depressive symptoms are often unrecognized and undertreated (Broadhead et al. 1990; Perez-Stable et al. 1990; Ormel et al. 1991; Bourdon et al. 1992; Kessler et al. 1994; Rost et al. 1994; Hirschfeld et al. 1997). Treatments for depression involving medication or psychotherapy have not only been shown to be effective in managing the illness but also improving work productivity (Kessler et al. 1999; Zhang et al. 1999; Wells et al. 2000). Policymakers must consider the potentially adverse labor market outcomes in older working-age individuals when estimating the cost of untreated depression and evaluating the value of interventions to improve the diagnosis and treatment of depression.

ACKNOWLEDGMENTS

This study was supported by The Robert Wood Johnson Foundation, Princeton, NJ and an NIH/NIA grant on Lifecycle Effects of Health Insurance on Elderly Health (R01 AG024451-01).

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SUPPLEMENTARY MATERIAL

The following supplementary material for this article is available online:

Appendix Figure 1: Flow-chart of Study Sample Selection.

Appendix Table 1: Discrete Logistic Regression Results in Men and Women in the Labor Force.*

Appendix Table 2: Odds Ratios for Retirement* by Depression Status Based on Analyses Truncating Follow-up after 6 years.

Appendix Table 3: Odds Ratios for Retirement* by Depression Status Based on Analyses Truncating Follow-up after 4 years.

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