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Depressive Symptoms and the Arthritis-Employment Interface: A Population-Level Study

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Abstract

Objective.—To examine the relationship between depressive symptoms, arthritis, and employment, and to determine whether this relationship differs across young, middle-age, and older working-age adults with arthritis.

Methods.—Data from the US National Health Interview Survey from 2013–2017 were analyzed. Analyses were restricted to adults with doctor-diagnosed arthritis of working age (ages 18–64 years) with complete data on depressive symptoms (n = 11,380). Covariates were sociodemographic information, health, and health system utilization variables. Employment prevalence was compared by self-reported depressive symptoms. We estimated percentages, as well as univariable and multivariable logistic regression models, to examine the relationship between depression and employment among young adults (ages 18–34 years), middle-age adults (ages 35–54 years), and older adults (ages 55–64 years).

Results.—Among all working-age US adults with arthritis, the prevalence of depressive symptoms was 13%. Those reporting depressive symptoms had a higher prevalence of fair/worse health (60%) and arthritis-attributable activity limitations (70%) compared to those not reporting depression (23% and 39%, respectively). Respondents with depressive symptoms reported significantly lower employment prevalence (30%) when compared to those not reporting depressive symptoms (66%) and lower multivariable-adjusted association with employment (prevalence ratio 0.88 [95% confidence interval (95% CI) 0.83–0.93]). Middle-age adults reporting

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AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be submitted for publication. Dr. Jetha had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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depression were significantly less likely to be employed compared to their counterparts without depression (prevalence ratio 0.83 [95% CI 0.77–0.90]); similar but borderline statistically significant relationships were observed for both young adults (prevalence ratio 0.86 [95% CI 0.74–0.99]) and older adults (prevalence ratio 0.94 [95% CI 0.86–1.03]).

Conclusion.—For adults with arthritis, depressive symptoms are associated with not participating in employment. Strategies to reduce arthritis-related work disability may be more effective if they simultaneously address mental health.

INTRODUCTION

Arthritis is one the most common causes of work disability in the US (1). Research on working-age adults (ages 18–64 years) indicates that arthritis is consistently associated with challenges in finding and sustaining employment and remaining productive at work (2–4). Emerging evidence also indicates that working-age adults with arthritis are more likely to live with depression when compared to adults without arthritis (5,6). Few studies have examined the role of depression in those living with arthritis who are unemployed, and whether differences exist across young adults (ages 18–34 years), middle-age adults (ages 35–54 years), and older working-age adults (ages 55–64 years).

In the US, 54 million adults are estimated to be living with arthritis, of which approximately three-fourths are working age (7). Among young, middle-age, and older working-age adults, arthritis is associated with not participating in employment (8,9). Those who are able to find paid work report workplace activity limitations, absenteeism, and presenteeism (2–4,10). Studies indicate that greater arthritis symptom severity (e.g., pain, fatigue, disease activity, and inflammation) and lower access to support within the workplace (e.g., job accommodations) are associated with challenges in employment and with difficulties at work (11–13). In addition, the employment experiences of people with arthritis can differ according to age and career phase (14).

It is important to acknowledge that employment is a critical social determinant of health for people with arthritis across the life course. Those experiencing challenges with work participation are more likely to report worse health status and a lower quality of life (15,16). The economic implications are also significant. Estimates from 2013 indicate that earnings losses attributed to arthritis totaled approximately $164 billion (17). Therefore, promoting the employment engagement of working-age adults with arthritis has significant personal and societal implications.

A number of studies indicate that adults with different forms of arthritis (5), including inflammatory arthritis (6) and osteoarthritis (18), are more likely to report depression compared to those without arthritis. Using the nationally representative National Health Interview Survey (NHIS), a recent study found that adults with arthritis are significantly more likely to report depressive symptoms (22.5%) compared to those without arthritis (10.7%) (5). Other research indicates that adults living with arthritis and depression are more likely to report greater symptom severity (e.g., pain, fatigue, disease activity, and inflammation) (19–21), functional limitations (18), and role participation restrictions when compared with those without depression (19,22).

Research among adults without arthritis highlights an interrelationship between depression and unemployment, underemployment, and productivity loss (23–26). Moreover, the co-occurrence of depression and a physical impairment can exacerbate employment difficulties (27,28). A population-based study of 22,118 working-age Canadians indicated that having a physical and mental health condition was associated with 2-times greater odds of reporting work disability when compared to either condition alone (27). In the nationally representative US National Comorbidity Survey, the co-occurrence of physical (i.e., arthritis, hypertension, asthma, or ulcers) and mental health disorders was significantly associated with role functioning impairment when compared to either physical or mental disorders alone (28). Indeed, among working-age adults with arthritis, depression can significantly add to the challenges faced with workforce participation.

It is important to acknowledge that the relationship between depression and employment of people with arthritis may vary when examined across young, middle-age, and older working-age adults. Population-level studies suggest that young people with (5) and without arthritis (29) are more likely to report a greater prevalence of depressive symptoms when compared to middle- and/or older-age adults. At the same time, research among those not living with arthritis indicates that depressive symptoms may be more likely to disrupt employment in older-age groups (23). No studies, to our knowledge, have compared the relationship between employment and the co-occurrence of depression and arthritis at different life phases.

We used data from the NHIS to examine the relationship between self-reported depressive symptoms and employment in working-age adults with doctor-diagnosed arthritis. We also examined whether the association between arthritis, depression, and employment differed across young, middle-age, and older working-age adults. We hypothesized that, among the US population with an arthritis diagnosis, self-reported depressive symptoms would be associated with a lower prevalence of employment participation when compared to those without self-reported depression. We also hypothesized that, among those with an arthritis diagnosis, older adults with self-reported depression would have a lower prevalence of employment participation when compared to young and middle-age adults.

MATERIALS AND METHODS

Sample.

Data from 2013–2017 NHIS were combined and analyzed. The NHIS is an ongoing cross-sectional survey of the civilian noninstitutionalized population of the US conducted by the National Center for Health Statistics (NCHS) (30). The complex multistaged survey oversamples underrepresented sociodemographic subgroups (30). Data are collected in-person by trained interviewers; participation is voluntary. We analyzed data from the files for sample adult, functioning and disability supplement, and imputed income. The functioning and disability supplement, which contained the questions used to ascertain depressive symptoms, was randomly administered to one-half of sample adults in each year (30). Overall sample adult response rates ranged from 53.0% (2017) to 61.2% (2013). Of note, we restricted the analysis to those of traditional working age (ages 18 to 64 years). Our analysis was also restricted to participants with doctor-diagnosed arthritis, identified by

"yes" to the question: "Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" (31).

Outcome measure.

The main outcome measure was employment status. Using a standard reference period of last week, respondents were asked about their employment status using the questions "What were you doing last week?" and "What is the main reason you did not work last week?" By combining responses, we classified respondents as employed, unemployed (not working but looking for work), unable to work/disabled, or other (i.e., retired, homemakers, or students, but not otherwise working). For dichotomous analyses, all categories except employed were classified as not working.

Primary independent variable.

Self-reported depressive symptoms were assessed using 2 questions generated by the NCHS using a definition developed by Guglielmo et al (5) in consultation with mental health experts and using Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition diagnostic criteria. First, participants were asked about the frequency of depressive symptoms using the question "How often do you feel depressed?" Response options were daily, weekly, monthly, a few times a year, never, or refused/don't know. Second, participants were asked about the intensity of depressive symptoms using the question "Thinking about the last time you felt depressed, how depressed did you feel?" Response options were "a lot," "in between a little and a lot," "a little," and "or refused/don't know." Participants who were categorized as reporting depressive symptoms selected "daily" or "weekly" for symptom frequency and indicated "a lot" or "in between a little and a lot" for depressive symptom intensity (5). Participants were also grouped into 3 categories of working-age adults based on age: young (ages 18–34 years), middle-age (ages 35–54 years), and older (ages 55–64 years) (32).

Covariates.

Sociodemographic, health, and health service use variables were examined as covariates and selected based on their relationship with employment participation of people with arthritis or depression in previous research (1,5).

Sociodemographic.—Aligning with past studies, we included information on sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other), and education (high school or less, high school graduate or equivalent, some college/associate degree, college graduate or above). Using imputed income files provided by NHIS, we also calculated the income-to-poverty ratio (IPR) based on total family income and family size to capture resources and demands (33). Using the IPR, participants were classified as poor/near poor (IPR <125%), low income (IPR 125–199%), middle income (IPR 200–400%), and high income (IPR >400%). Additionally, social participation restriction was identified using 2 questions that asked respondents to rate their difficulty to "go out to things like shopping, movies, or sporting events" and "participate in social activities such as visiting friends, attending clubs and meetings, going to parties?" Those who reported "very difficult"

or “can’t do at all” to 1 or both questions were categorized as having social participation restriction.

Health.—We included self-reported health (categorized as excellent/very good, good, fair/poor), the number of comorbid conditions from a list of 9 (hypertension, heart diseases, stroke, diabetes mellitus, current asthma, cancer [excluding nonmelanoma skin cancer], weak or failing kidneys, hepatitis, and chronic obstructive pulmonary disease) (34) and body mass index (calculated as kg/m^2 from self-reported weight and height: underweight/healthy weight [<25.0], overweight [25.0–29.9], and obese [≥30]). Similar to depressive symptoms, self-reported anxiety symptoms were assessed using 2 questions on the frequency and severity of anxiety in the past week. Participants who reported “daily or weekly” anxiety symptom frequency and indicated “a lot” or “in between a little and a lot” of anxiety were categorized as having anxiety symptoms (5).

The number of functional limitations was measured based on 9 tasks where “very difficult” or “can’t do” was reported (push/pull large objects, walk one-fourth mile, stand for 2 hours, sit for 2 hours, stoop/bend/kneel, reach over one’s head, grasp small objects, climb stairs, lift or carry 10 pounds). Those with an arthritis-attributable activity limitation were identified by “yes” to the question “Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?” Aerobic physical activity was assessed by self-reported duration of moderate- or vigorous-intensity leisure time aerobic physical activity/week. Reported vigorous-intensity physical activity minutes were counted double and added to moderate-intensity physical activity minutes. Respondents were classified as being physically active (≥150 minutes), insufficiently active (1–149 minutes), or inactive (0 minutes) (35). The presence or absence of health insurance (30), the usual place for care, and the number of ambulatory visits in the past year were assessed.

Statistical analysis.

First, we estimated the distribution of study population characteristics among those with and without self-reported depressive symptoms. Estimates were compared with nonoverlapping 95% confidence intervals (95% CIs) indicating a significant difference (36). Next, we generated prevalence estimates with 95% CIs of employment by sociodemographic, health, and health service use variables among those with and without depressive symptoms. Absolute differences between prevalence estimates of employment were calculated by comparing prevalence among participants with and without depressive symptoms. Estimates were compared with nonoverlapping 95% CIs, as well as with the computation of absolute differences in estimates and *t*-tests to examine significant differences ($\alpha < 0.05$).

Unadjusted and multivariable-adjusted prevalence ratios from logistic regression models were used to estimate the association between depressive symptoms and employment status. For multivariable modeling, a backwards elimination strategy was used to select covariates that were significantly associated with employment in the unadjusted model and did not exhibit multicollinearity with other covariates. Because the relationship between depression and employment status can vary by age (32), we generated a multivariable model that contained all of the variables identified in the backwards elimination strategy described

above, depressive symptoms, and age group. We also report estimates from the multivariable model containing the interaction term because the prevalence ratios for the model containing the interaction term were within 2% of the prevalence ratios for the multivariable model without the interaction term.

To generate nationally representative population estimates, sampling weights created by the NCHS specifically for the functioning and disability supplement (which differ from the standard sample adult weights) were adjusted for combining 5 years of data and used in all analyses. All SE estimates were adjusted for the complex survey design of the NHIS. Estimates with a relative SE of 20.0–29.9% were considered unstable and were flagged and should be interpreted with caution; estimates based on an unweighted sample size of <30 are not reported. SAS software, version 9.4 (37) and SUDAAN 11.0 (38) were used to conduct the analyses.

RESULTS

A description and comparison of the overall study population and of those with and without depressive symptoms are shown in Table 1. More than one-half of all working-age participants with arthritis were women (59%) and were of non-Hispanic White race/ethnicity (74%). Less than one-half of participants were of middle (46%) or older working-age (44%), and less than one-half reported an associate degree/some college (34%) or being a college graduate (27%) or had an IPR >400% (40%). The overall prevalence of employment was 61%.

The majority of the study population indicated no social participation restrictions (91%) or self-reported anxiety symptoms (78%). More than one-half of the population had no arthritis-attributable activity limitation (56%) or functional limitations (63%). Close to one-third indicated excellent/very good self-rated health (39%). Approximately one-half of participants reported obesity (45%) and 1–2 comorbid conditions (48%). An examination of health service use variables indicated that 42% of participants reported 0–3 ambulatory visits in the past year, and most reported having health insurance coverage (91%) and a usual place for care (93%) (Table 1).

The prevalence of depressive symptoms was 13% overall among working-age adults living with arthritis (Table 1). When compared with those not living with depressive symptoms, participants with depressive symptoms were more frequently women (57% versus 66%), were middle-age adults (45% versus 51%), reported less than a high school education (11% versus 19%), had an IPR <125% (16% versus 41%), and indicated a greater prevalence of social participation restrictions (6% versus 26%). No differences existed when comparing participants with and without depressive symptoms according to race/ethnicity. Of note, participants with depressive symptoms indicated a lower prevalence of employment (30%) in comparison with those not reporting depressive symptoms (66%). In addition, those with depressive symptoms indicated a greater prevalence of being unable to work/disabled (50%) when compared with those without depressive symptoms (16%) (Table 1 and Figure 1).

When compared with those without depressive symptoms, participants reporting depressive symptoms more often had a higher prevalence of fair/poor health (23% versus 60%), anxiety symptoms (13% versus 79%), obesity (45% versus 51%), arthritis-attributable activity limitation (39% versus 70%), ≥4 functional limitations (11% versus 37%), and physical inactivity (31% versus 48%). When compared with those without depressive symptoms, those reporting depressive symptoms more frequently indicated a higher number of ambulatory visits (≥16) (11% versus 26%) and having no health insurance coverage (9% versus 14%). A similar frequency of participants with and without depressive symptoms indicated a usual place for care (Table 1).

Across all study variables, working-age adults with arthritis who reported depressive symptoms had a lower prevalence of employment when compared with those not reporting depressive symptoms (Table 2). For participants with depressive symptoms, younger adults (40%) more frequently reported employment when compared with older adults (26%) and middle-age adults (32%) (Table 2 and Figure 1). When compared with those not reporting depressive symptoms, employment prevalence among those with depressive symptoms was less frequent for men (71% versus 27%) and for those with an IPR <125% (36% versus 15%) and who indicated a social participation restriction (17% versus 10%). When compared with those not reporting depressive symptoms, employment prevalence among those reporting depressive symptoms was lowest for participants with fair/poor self-rated health (36% versus 16%), obesity (63% versus 29%), ≥3 comorbid conditions (40% versus 16%), arthritis-attributable activity limitation (46% versus 19%), and ≥4 functional limitations (19% versus 11%).

The unadjusted and multivariable-adjusted relationship between employment and each study variable is shown in Table 3. The unadjusted model indicated that having depressive symptoms was significantly associated with a lower likelihood of employment (prevalence ratio 0.46 [95% CI 0.42–0.51]). Findings from the multivariable-adjusted model indicated that, when controlling for all other variables in the model, depressive symptoms among working-age adults with arthritis were significantly associated with not participating in employment (prevalence ratio 0.88 [95% CI 0.83–0.93]). Middle-age adults reporting depressive symptoms were significantly less likely to be employed (prevalence ratio 0.83 [95% CI 0.77–0.90]) when compared with middle-age counterparts not reporting depression; we found borderline statistically significant associations between depression and employment for both younger (prevalence ratio 0.86 [95% CI 0.74–0.99]) and older adults (prevalence ratio 0.94 [95% CI 0.86–1.03]).

DISCUSSION

Employment is a critical social determinant of health that provides access to income and other resources that support health and quality of life (39). Individuals living with different forms of arthritis are more likely to live with depressive symptoms when compared with those not living with arthritis. The co-occurrence of arthritis and depression can play a significant role in shaping labor market experiences. Using a nationally representative US population health survey, we examined the association between self-reported depressive symptoms and employment among a large sample of working-age adults with arthritis.

Findings indicated that depression was significantly associated with not participating in employment. The relationship between depression and not participating in employment was most significant for young and middle-age adults with arthritis. Our findings underscore the substantial negative impact of depression in the workforce engagement of individuals living with arthritis and highlights the need for additional research to unpack the relationship between mental health, employment participation, and arthritis conditions among working-age people. Results also provide additional support for the consideration of mental health in designing and tailoring of workplace policies and programs for individuals with arthritis.

Our study is one of the first to examine the interrelationship between self-reported depression, arthritis, and employment in a nationally representative population-level survey of US adults. Supporting our first hypothesis, we found that working-age adults with doctor-diagnosed arthritis who also reported depression were less likely to participate in employment when compared to their counterparts without depression. Aligning with previous research, participants in our study who reported both arthritis and depressive symptoms were more likely to indicate fair/poor self-rated health, arthritis-attributable activity limitation, and a social participation restriction (19,20,22). Acknowledging that the study findings are cross-sectional is important, and we cannot establish causality. At the same time, several potential mechanisms could explain the results. Perhaps depressive symptoms can exacerbate the employment participation restrictions faced by individuals with arthritis (19). Alternatively, arthritis-related work disability could be a stressor that contributes to depressive symptoms. More likely, arthritis, depression, and employment are reciprocally related to one another. Longitudinal research is required to examine the interconnection between arthritis, depression, and employment participation. In addition, we acknowledge that different forms of arthritis have distinct pathophysiology results and concomitant symptoms and require different pharmacologic and nonpharmacologic treatment. Research examining the impact of depression on employment should be conducted in participants with different arthritis diagnoses to develop tailored work disability prevention recommendations.

Nonetheless, our study adds preliminary support for the health and economic benefits of treating depressive symptoms among people living with arthritis. Studies of individuals with and without arthritis highlight clinical and labor market benefits of certain mental health care treatments (e.g., cognitive behavioral therapy or mindfulness-based stress reduction) (40–42). Attention has also been directed to workplace-based mental health treatment (e.g., work-focused cognitive behavioral therapy) and accommodations (e.g., workplace flexibility) to prevent work disability of people with depression (43,44). In light of our study findings, mental health care could be especially beneficial for those experiencing a co-occurrence of arthritis and depression who are not participating in employment, and such health care could complement existing evidence-based programs that address the physical arthritis symptoms to prevent work disability (45,46). Importantly, other research indicates that mental health care services are often underused in individuals with and without arthritis (21,47,48). Underuse of mental health care has been attributed to gaps in health insurance coverage, high costs of care, lack of recognition of depressive symptoms and referral from a treating physician, and challenges faced by people with depression in communicating symptoms (21,48). More research is required to examine ways in which different forms of

mental health care can be integrated into clinical and workplace practices for people with arthritis and to identify strategies that encourage access to treatment. Additional research is also needed to examine the effectiveness of workplace- and nonworkplace-based mental health treatments in supporting the employment of individuals with arthritis.

Among working-age adults with arthritis, the prevalence of depression and its impact on labor market activity differs across the life course. Interestingly, our study indicated that middle-age adults with arthritis were more likely to report depression when compared with young and older working-age respondents with arthritis. In contrast to our second study hypothesis, findings from our multivariable model indicated that, although borderline, depression in middle-age adults with arthritis was related to not participating in employment. Previous research finds that middle-age adults report that arthritis can have a particular impact on involvement in a number of valued social roles, including employment and family life (32,49). The co-occurrence of arthritis and depression has the potential to exacerbate participation restrictions during this period. Study findings can be interpreted within the context of a decreasing life expectancy in the US population. Recent population-level data indicate that middle-age adults are experiencing the most significant retrogression of all-cause mortality (50). Promoting the labor market participation of people with arthritis and depression, especially of middle-age adults, provides a pathway to improving health and quality of life and decreasing mortality (39,50). Although borderline significant, our study found that young adult participants reporting depression were less likely to be employed. For individuals with arthritis, depression at younger ages has the potential to impact entry into the labor market and employment across the life course. To advance our findings, more evidence is needed to understand how depression can impact employment participation at different ages and stages of working life. Indeed, additional research specifically on young adults with arthritis could reveal insights on the impact of mental health during the school-to-work transition. Research is required to examine the potential immediate and longer-term benefits of mental health treatment and interventions that are targeted to middle-age adults with arthritis.

There are several study strengths and limitations to acknowledge. Using the NHIS, we were able to capture a large, representative sample of young, middle-age, and older working-age adults with arthritis, including osteoarthritis, rheumatoid arthritis, gout, lupus, fibromyalgia, or other forms of rheumatic disease and to collect a range of sociodemographic, health, and health service use characteristics. While self-reported measures do not substitute for a clinical diagnosis, they are often considered valid case-finding questions for public health surveillance (5,31). It is also important to highlight that both arthritis and depression are considered episodic conditions, with symptoms that fluctuate in severity, and we are unable to highlight the unpredictable interruptions to employment that stem from both physical and mental health conditions. Last, our study focuses only on employment status as the main work outcome measures. Additional research is required to elaborate on the relationship between depressive symptoms and at-work experiences (e.g., absenteeism and presenteeism) of people with arthritis.

Among working-age adults living with arthritis, depression can significantly limit labor market participation. The association between depression and employment may be more

salient for middle-age adults and potentially for young adults with arthritis. We provide an important foundation for future research to unpack the relationship between arthritis, depression, and workforce engagement. Of significance, our findings point to the importance of considering mental health in the design and delivery of policies and programs within workplace, community, and clinical settings that support the employment of individuals with arthritis.

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SIGNIFICANCE & INNOVATIONS

- At the population-level, our study is one of the first to show the age-specific relationship between arthritis, depressive symptoms, and employment in the US using a nationally representative survey.
- Among working-age adults with arthritis, we present evidence of the striking relationship between reporting depressive symptoms and not participating in employment.
- Our study points to the importance of prioritizing mental health initiatives that address work disability for adults living with arthritis.
- The relationship between depressive symptoms and not participating in employment was the most pronounced for middle-age adults, which suggests a need for the design of age-specific interventions.

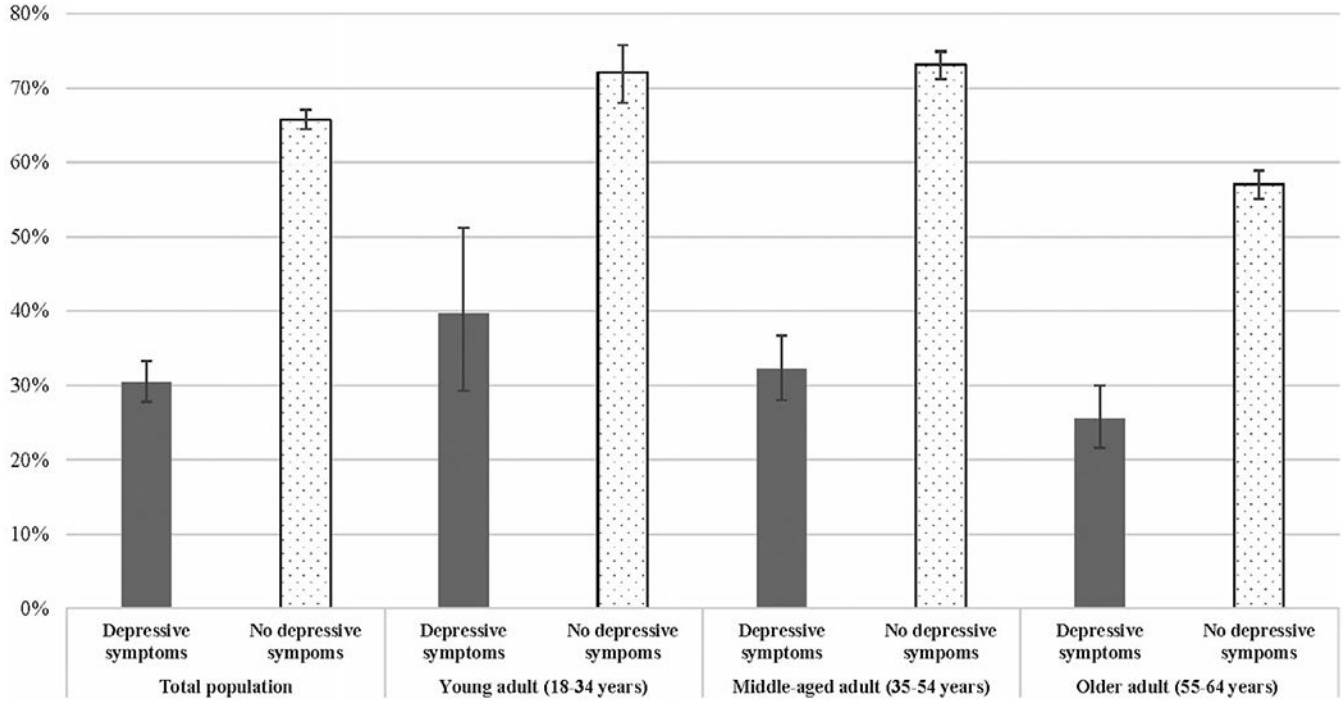

Figure 1.

Prevalence of employment among working-age adults (ages 18–64 years) in the US with doctor-diagnosed arthritis, National Health Interview Survey, 2013–2017. Employment was compared between those with and without self-reported depressive symptoms and across age groups among adults with arthritis. See Materials and Methods for participant questions and categorizations.

Table 1.

Weighted distribution of sample characteristics of working-age adults (ages 18–64 years) in the US with doctor-diagnosed arthritis using the 2013–2017 National Health Interview Survey (NHIS) data, comparing those with and without self-reported depressive symptoms *

	Total sample				Depressive symptoms				No depressive symptoms			
	Sample size	Population, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI
Total	11,380	32,839	–	–	1,645	4,123	13.2	12.4–14.0	9,191	27,164	86.8	86.0–87.6
Sociodemographic factors												
Sex												
Men	4,401	13,525	41.2	39.9–42.5	515	1,400	34.0	30.9–37.1	3,694	11,588	42.7	41.3–44.1
Women	6,979	19,314	58.8	57.5–60.1	1,130	2,723	66.0	62.9–69.1	5,497	15,576	57.3	55.9–58.7
Age, years												
Young adult (18–34)	1,027	3,319	10.1	9.4–10.9	143	443	10.7	8.7–13.1	842	2,707	10.0	9.2–10.8
Middle-age adult (35–54)	4,928	14,937	45.5	44.3–46.7	796	2,090	50.7	47.4–53.9	3,899	12,238	45.1	43.7–46.4
Older adult (55–64)	5,425	14,583	44.4	43.2–45.7	706	1,590	38.6	35.4–41.8	4,450	12,220	45.0	43.6–46.4
Race/ethnicity												
Non-Hispanic White	8,126	24,141	73.5	72.3–74.7	1,161	2,985	72.4	69.2–75.3	6,613	20,084	73.9	72.6–75.2
Non-Hispanic Black	1,700	4,298	13.1	12.3–14.0	244	568	13.8	11.6–16.3	1,355	3,485	12.8	11.9–13.8
Hispanic	1,112	3,128	9.5	8.6–10.5	182	427	10.4	8.5–12.5	864	2,525	9.3	8.4–10.3
Non-Hispanic other	442	1,272	3.9	3.4–4.4	58	143	3.5	2.4–5.0	359	1,070	3.9	3.4–4.5
Education												
Less than high school	1,494	3,925	12.0	11.2–12.8	349	791	19.2	17.0–21.7	1,060	2,963	10.9	10.1–11.8
High school or equivalent	3,049	8,937	27.3	26.2–28.4	449	1,206	29.3	26.3–32.6	2,440	7,263	26.8	25.6–28.1
Associate degree/some college	3,947	11,038	33.7	32.5–34.9	582	1,396	33.9	30.9–37.1	3,178	9,088	33.5	32.2–34.9
College graduate or above	2,864	8,850	27.0	25.8–28.3	263	720	17.5	15.2–20.1	2,491	7,779	28.7	27.4–30.1
Employment status												
Employed	6,535	19,949	60.8	59.5–62.0	508	1,255	30.4	27.8–33.3	5,765	17,855	65.7	64.4–67.1
Unemployed	472	1,352	4.1	3.7–4.6	116	303	7.4	5.7–9.4	329	982	3.6	3.1–4.2
Unable to work/disabled	2,814	6,875	20.9	19.9–22.0	863	2,064	50.1	46.7–53.4	1,761	4,359	16.1	15.1–17.1
Other †	1,556	4,658	14.2	13.3–15.1	158	501	12.1	10.0–14.6	1,333	3,963	14.6	13.6–15.6

	Total sample				Depressive symptoms				No depressive symptoms			
	Sample size	Population, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI
Income-to-poverty ratio‡												
Poor (<125%)	2,935	6,571	20.0	19.0–21.1	796	1,690	41.0	37.6–44.4	1,937	4,451	16.4	15.3–17.5
Low income (125–199%)	1,563	4,230	12.9	12.1–13.7	251	708	17.2	14.6–20.1	1,231	3,275	12.1	11.2–12.9
Middle income (200–400%)	2,950	8,927	27.2	26.1–28.3	367	1,110	26.9	24.1–29.9	2,471	7,465	27.5	26.3–28.7
High income (>400%)	3,933	13,110	39.9	38.6–41.3	231	615	14.9	12.8–17.4	3,552	11,974	44.1	42.6–45.6
Social participation restriction												
Yes	1,150	2,851	8.7	8.0–9.4	455	1,051	25.5	22.7–28.5	615	1,550	5.7	5.1–6.3
No	10,218	29,954	91.3	90.6–92.0	1,189	3,070	74.5	71.5–77.3	8,574	25,610	94.3	93.7–94.9
Health factors												
Self-rated health												
Excellent/very good	4,161	12,836	39.1	37.8–40.4	208	607	14.7	12.3–7.5	3,800	11,740	43.2	41.8–44.7
Good	3,620	10,585	32.2	31.0–33.5	414	1,029	25.0	22.4–27.7	3,057	9,131	33.6	32.2–35.0
Fair/poor	3,595	9,409	28.7	27.5–29.9	1,022	2,482	60.3	57.2–63.3	2,333	6,291	23.2	22.0–24.3
Self-reported anxiety symptoms												
Yes	2,572	6,834	21.8	20.8–22.8	1,311	3,268	79.3	76.6–81.8	1,242	3,530	13.0	12.1–13.9
No	8,284	24,504	78.2	77.2–79.2	332	852	20.7	18.2–23.4	7,933	23,600	87.0	86.1–87.9
Body mass index, kg/m^2												
Under/healthy weight (<25.0)	2,581	7,390	23.4	22.4–24.5	361	864	21.6	18.9–24.5	2,095	6,154	23.4	22.3–24.6
Overweight (25.0–29.9)	3,377	9,902	31.4	30.3–32.5	428	1,096	27.4	24.4–30.6	2,814	8,443	32.1	30.9–33.4
Obese (≥30.0)	4,965	14,256	45.2	43.9–46.5	811	2,043	51.0	47.5–54.6	3,982	11,700	44.5	43.1–45.9
Number of comorbid conditions§												
0	4,003	12,260	37.3	36.1–38.6	347	984	23.9	21.0–27.0	3,472	10,728	39.5	38.1–40.9
1–2	5,580	15,894	48.4	47.1–49.7	791	1,970	47.8	44.5–51.0	4,530	13,188	48.5	47.1–50.0
≥3	1,797	4,684	14.3	13.4–15.1	507	1,169	28.4	25.7–31.1	1,189	3,248	12.0	11.1–12.9
Arthritis-attributable activity limitations												
Yes	5,199	14,288	43.5	42.2–44.9	1,185	2,883	70.0	66.8–73.0	3,707	10,545	38.9	37.5–40.2
No	6,174	18,520	56.5	55.1–57.8	459	1,235	30.0	27.0–33.2	5,478	16,594	61.1	59.8–62.5

	Total sample				Depressive symptoms				No depressive symptoms			
	Sample size	Population, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI
Aerobic physical activity level[¶]												
Inactive	3,876	10,740	33.3	32.0–34.6	795	1,969	48.4	45.0–51.9	2,875	8,191	30.5	29.2–31.9
Insufficiently active	2,519	7,423	23.0	21.9–24.1	366	944	23.2	20.4–26.3	2,066	6,257	23.3	22.1–24.5
Active	4,773	14,107	43.7	42.4–45.0	456	1,154	28.4	5.4–31.6	4,129	12,403	46.2	44.8–47.6
Functional limitations[#]												
0	6,851	20,729	63.2	61.9–64.4	491	1,332	32.3	29.2–35.6	6,086	18,569	68.4	67.1–69.6
1–3	2,545	7,092	21.6	20.6–22.6	504	1,282	31.1	28.2–34.2	1,917	5,483	20.2	19.1–21.3
≥4	1,975	4,989	15.2	14.3–16.1	650	1,509	36.6	33.5–39.8	1,187	3,110	11.4	10.6–12.3
Health service use												
Ambulatory care visits in past year												
0–3	4,607	13,724	42.4	41.1–43.8	380	995	24.2	21.4–27.3	4,084	12,311	45.4	43.9–46.9
4–9	3,457	9,947	30.7	29.6–32.0	484	1,224	29.8	26.9–32.9	2,852	8,349	30.8	29.5–32.1
10–15	1,658	4,586	14.2	13.3–15.1	357	821	20.0	17.5–22.7	1,232	3,555	13.1	12.2–14.1
≥16	1,478	4,102	12.7	11.8–13.6	415	1,065	25.9	23.1–9.1	1,004	2,903	10.7	9.8–11.6
Usual place for care												
Yes	10,486	30,203	92.6	91.8–93.4	1,530	3,812	92.5	90.5–94.1	8,517	25,150	92.6	91.6–93.4
No	813	2,407	7.4	6.6–8.2	115	311	7.5	5.9–9.5	673	2,012	7.4	6.6–8.4
Health insurance												
Not covered	1,136	3,108	9.5	8.8–10.3	189	584	14.2	12.0–16.8	904	2,413	8.9	8.1–9.8
Covered	10,214	29,624	90.5	89.7–91.2	1,451	3,527	85.8	83.2–88.0	8,266	24,673	91.1	90.2–91.9

[*] Doctor-diagnosed arthritis was identified by “yes” to the question “Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?” For depressive symptoms, participants were asked about the frequency (“How often do you feel depressed?” [daily, weekly, monthly, a few times a year, never, or refused/don’t know]) and intensity (“Thinking about the last time you felt depressed, how depressed did you feel?” [a lot, in between a little and a lot, a little, or refused/don’t know]) of depressive symptoms. Participants were categorized as reporting depressive symptoms by reporting “daily” or “weekly” for symptom frequency and “a lot” or “in between a little and a lot” for depressive symptom intensity. 95% CI = 95% confidence interval.

[†] Other refers to participants who are retired, homemakers, or students, but not otherwise working.

[‡] Calculated using imputed income files from the NHIS and based on total family income and family size.

[§] Nine possible comorbid conditions examined were hypertension, heart diseases, stroke, diabetes mellitus, asthma, cancer, weak or failing kidneys, hepatitis, and chronic obstructive pulmonary disease.

[¶]Physically active (≥150 minutes moderate-intensity, leisure time, aerobic physical activity/week), insufficiently active (1–149 minutes moderate-intensity, leisure time, aerobic physical activity/week), inactive (0 minutes moderate-intensity, leisure time, aerobic physical activity/week).

[#]Number of functional limitations was measured for 9 tasks (e.g., push/pull large objects, walk one-fourth mile, stand for 2 hours, sit for 2 hours, stoop/bend/kneel, reach over one's head, grasp small objects, climb stairs, lift or carry 10 pounds); limitation was identified for responses of "very difficult" or "can't do."

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Table 2.

Weighted prevalence of employment participation among working-age US adults (ages 18–64 years) with doctor-diagnosed arthritis using 2013–2017 National Health Interview Survey (NHIS) data, comparing those with and without self-reported depressive symptoms[*]

	Arthritis and depressive symptoms				Arthritis and no depressive symptoms				
	Sample size	**No. weighted, 1,000s**	**%**	**95% CI**	**Sample size**	**No. weighted, 1,000s**	**%**	**95% CI**	**Absolute % difference[†]**
Total	508	1,255	30.4	27.8–33.3	5,765	17,855	65.7	64.4–67.1	35.3
Sociodemographic factors									
Sex									
Men	153	381	27.2	22.6–32.3	2,490	8,306	71.7	69.7–73.5	44.5
Women	355	874	32.1	28.7–35.7	3,275	9,549	61.3	59.5–63.1	29.2
Age, years									
Young adult (18–34)	63	176	39.7	29.3–51.2	600	1,950	72.1	68.0–75.8	32.3
Middle-age adult (35–54)	254	673	32.2	28.0–36.7	2,732	8,940	73.1	71.2–74.9	40.8
Older adult (55–64)	191	406	25.5	21.6–29.9	2,433	6,965	57.0	55.1–58.9	31.5
Race/ethnicity									
Non-Hispanic White	383	947	31.7	28.6–35.1	4,298	13,586	67.7	66.1–69.2	35.9
Non-Hispanic Black	51	126	22.1	15.9–29.9	723	2,043	58.7	55.0–62.2	36.5
Hispanic	53	128	30.0	22.0–39.4	523	1,564	61.9	57.3–66.3	31.9
Non-Hispanic other	≠	54	37.6[≠]	22.5–55.6	221	663	61.9	54.8–68.5	24.3
Education									
Less than high school	48	119	15.0	10.3–21.3	446	1,338	45.1	40.9–49.4	30.1
High school or equivalent	118	302	25.0	20.3–30.3	1,348	4,266	58.8	56.1–61.3	33.8
Associate degree/some college	201	458	32.8	28.2–37.8	2,006	5,957	65.6	63.3–67.7	32.7
College graduate or above	140	371	51.5	44.2–58.8	1,956	6,266	80.6	78.4–82.6	29.1
Income-to-poverty ratio[§]									
Poor (<125%)	124	253	14.9	12.0–18.5	597	1,602	36.0	32.9–39.2	21.0
Low income (125–199%)	76	198	28.0	21.4–35.8	632	1,634	49.9	45.9–53.9	21.9
Middle income (200–400%)	167	462	41.6	35.3–48.3	1,667	4,968	66.6	63.9–69.1	24.9
High income (>400%)	140	342	55.6	47.8–63.2	2,869	9,651	80.6	78.8–82.3	25.0
Social participation									

	Arthritis and depressive symptoms				Arthritis and no depressive symptoms				
	Sample size	No. weighted, 1,000s	%	95% CI	Sample size	No. weighted, 1,000s	%	95% CI	Absolute % difference[†]
Yes	50	100	9.5	6.8–13.1	92	255	16.5	12.9–20.7	6.9
No	458	1,155	37.6	34.3–41.1	5,671	17,596	68.7	67.3–70.1	31.1
Health factors									
Self-rated health									
Excellent/very good	136	355	58.5	48.6–67.8	3,000	9,338	79.5	77.8–81.1	21.0
Good	199	516	50.1	44.3–56.0	2,040	6,271	68.7	66.3–71.0	18.6
Fair/poor	173	384	15.5	12.9–18.5	725	2,246	35.7	33.0–38.5	20.2
Self-reported anxiety symptoms									
Yes	390	951	29.1	26.0–32.4	633	1,944	55.1	51.2–58.9	26.0
No	118	304	35.7	29.3–42.7	5,125	15,895	67.4	65.9–68.8	31.6

[*] Doctor-diagnosed arthritis was identified by “yes” to the question “Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?” For depressive symptoms, participants were asked about the frequency (“How often do you feel depressed?” [daily, weekly, monthly, a few times a year, never, or refused/don’t know]) and intensity (“Thinking about the last time you felt depressed, how depressed did you feel?” [a lot, in between a little and a lot, a little, or refused/don’t know]) of depressive symptoms. Participants were categorized as reporting depressive symptoms by reporting “daily” or “weekly” for symptom frequency and “a lot” or “in between a little and a lot” for depressive symptom intensity. 95% CI = 95% confidence interval.

[†] Significance of all absolute differences was based on a t-test, with $P < 0.0001$.

[‡] Estimates with a relative SE 20.0–29.9% were considered unstable and should be interpreted with caution; estimates based on <30 unweighted cases are not reported.

[§] Calculated using imputed income files from the NHIS and based on total family income and family size.

Table 3.

Univariable and multivariable prevalence ratios (PRs) for the relationship between study variables (sociodemographic characteristics, health factors, and health service use) and employment among adults (ages 18–64 years) in the US with doctor-diagnosed arthritis, National Health Interview Survey (NHIS), 2013–2017*

	Univariable		Multivariable	
	PR	**95% CI**	**PR**	**95% CI**
Depressive symptoms†				
Yes	0.46	0.42–0.51	0.88	0.83–0.93
No	1.00	–	1.00	–
Sociodemographic factors				
Sex				
Men	1.00	–	1.00	–
Women	0.85	0.82–0.88	0.92	0.89–0.95
Age, years				
Young adult (18–34)	1.0	–	1.00	–
Middle-age adult (35–54)	0.98	0.92–1.05	1.04	0.99–1.09
Older adult (55–64)	0.79	0.74–0.84	0.84	0.77–0.89
Race/ethnicity				
Non-Hispanic White	1.00	–	≠	–
Non-Hispanic Black	0.84	0.79–0.90	–	–
Hispanic	0.91	0.85–0.99	–	–
Non-Hispanic other	0.93	0.84–1.04	–	–
Education				
Less than high school	0.71	0.65–0.79	≠	–
High school or equivalent	1.00	–	–	–
Some college/associate degree	1.14	1.08–1.21	–	–
College graduate or above	1.46	1.39–1.53	–	–
Income-to-poverty ratio§			1.00	
Poor (<125%)	1.50	1.33–1.70	1.21	1.10–1.32
Low income (125–199%)	2.10	1.92–2.30	1.44	1.34–1.55

	Univariable		Multivariable	
	PR	95% CI	PR	95% CI
Middle income (200–400%)	2.63	2.42–2.87	1.65	1.53–1.77
High income (>400%)	1.00	–	–	–
Social participation				
Yes	0.22	0.18–0.26	0.78	0.70–0.88
No	1.00	–	1.00	–
Health factors				
Self-rated health				
Excellent/very good	1.00	–	1.00	–
Good	0.85	0.81–0.88	1.00	0.96–1.05
Fair/poor	0.38	0.36–0.41	0.83	0.78–0.88
Self-reported anxiety symptoms				
Yes	0.64	0.60–0.69	≠	–
No	1.00	–	–	–
Body mass index, kg/m^2			≠	
Under/healthy weight (<25.0)	1.00	–	–	–
Overweight (25.0–29.9)	1.06	1.01–1.12	–	–
Obese (≥30.0)	0.94	0.89–1.00	–	–
Number of comorbid conditions[¶]				
0	1.00	–	1.00	–
1–2	0.80	0.77–0.83	0.95	0.91–0.99
≥3	0.44	0.40–0.49	0.90	0.85–0.96
Arthritis-attributable activity limitations				
Yes	0.53	0.51–0.56	0.84	0.81–0.88
No	1.00	–	1.00	–
Aerobic physical activity level[#]				
Inactive	1.00	–	–	–
Insufficiently active	1.37	1.29 –1.46	–	–
Active	1.56	1.48 –1.64	–	–
Functional limitations[**]				

	Univariable		Multivariable	
	PR	**95% CI**	**PR**	**95% CI**
0	1.00	–	1.00	–
1–3	0.59	0.55–0.62	0.85	0.81–0.90
≥4	0.22	0.19–0.26	0.70	0.61–0.78
Health service use				
Ambulatory care visits in past year				
0–3	1.00	–	1.00	–
4–9	0.82	0.79–0.86	0.94	0.90–0.98
10–15	0.66	0.62–0.71	0.91	0.87–0.96
≥16	0.58	0.54–0.64	0.93	0.93–0.99
Usual place for care				
Yes	0.98	0.91 - 1.06	–	–
No	1.00	–	‡	–
Health insurance				
Not covered	1.00	–	‡	–
Covered	1.17	1.09–1.26	–	–
Interaction effects of depressive symptoms (age, years) ††				
Young adult (18–34)	–	–	0.86	0.74–0.99
Middle-age adult (35–54)	–	–	0.83	0.77–0.90
Older adults (55–64)	–	–	0.94	0.86–1.03

*Doctor-diagnosed arthritis was identified by“yes” to the question “Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?” 95% CI = 95% confidence interval.

†For depressive symptoms, participants were asked about the frequency (“How often do you feel depressed?” [daily, weekly, monthly, a few times a year, never, or refused/don’t know]) and intensity (“Thinking about the last time you felt depressed, how depressed did you feel?” [a lot, in between a little and a lot, a little, or refused/don’t know]) of depressive symptoms. Participants were categorized as reporting depressive symptoms by reporting “daily” or “weekly” for symptom frequency and “a lot” or “in between a little and a lot” for depressive symptom intensity.

‡Variable not included in the multivariable model as a result of our backwards elimination strategy.

§Calculated using imputed income files from the NHIS and based on total family income and family size.

¶Nine possible comorbid conditions examined were hypertension, heart diseases, stroke, diabetes mellitus, asthma, cancer, weak or failing kidneys, hepatitis, and chronic obstructive pulmonary disease.

[#]Physically active (≥150 minutes moderate-intensity, leisure time, aerobic physical activity/week), insufficiently active (1–149 minutes moderate-intensity, leisure time, aerobic physical activity/week) or inactive (0 minutes moderate-intensity, leisure time, aerobic physical activity/week).

[**]Number of functional limitations was measured for 9 tasks (e.g., push/pull large objects, walk one-fourth mile, stand for 2 hours, sit for 2 hours, stoop/bend/kneel, reach over one's head, grasp small objects, climb stairs, lift or carry 10 pounds); limitation was identified for responses of "very difficult" or "can't do."

[††]Reference is no depressive symptoms.