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Employment Exit and Entry among U.S. Adults with and without Arthritis during the Great Recession, a Longitudinal Study: 2007-2009, NHIS/MEPS

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Abstract

BACKGROUND: Negative employment consequences of arthritis are known but not fully understood. Examining transitions in and out of work can provide valuable information.

OBJECTIVE: To examine associations of arthritis with employment during the Great Recession and predictors of employment transitions.

METHODS: Data were for 3,277 adults ages 30-62 years with and without arthritis from the 2007 National Health Interview Survey followed in the Medical Expenditure Panel Survey 2008-2009. Employment (working vs. not working) was ascertained at baseline and five follow-ups. We estimated Kaplan Meier survival curves with 95% confidence intervals (CI) separately for time to stopping work (working at baseline) and starting work (not working at baseline) using Cox proportional hazards regression models with hazard ratios (HR).

RESULTS: Arthritis was significantly associated with greater risk of stopping work (HR = 1.7, 95% CI = 1.3-2.2; adjusted HR = 1.5, 95% CI = 1.1-2.0) and significantly associated with 40% lower chance of starting work (HR = 0.6, 95% CI = 0.4-0.8); which reversed on adjustment (HR = 1.5, 95% CI = 1.0-2.2). Employment predictors were mixed by outcome.

CONCLUSIONS: During the Great Recession, adults with arthritis stopped work at higher rates and started work at lower rates than those without arthritis.

Keywords

rheumatic disease; work; economic impact; population-based; public health

1. Introduction

The Great Recession (officially December 2007 to June 2009) [1] was the longest and deepest recession since World War II. Monthly job losses in the six month period from October 2008 through April 2009 were the highest since 1945, employment decreased

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by 6.3% [2], and unemployment doubled between December 2007 and October 2009 [1]. Also notable has been the dramatic and disproportionate employment toll on workers with disabilities [3] and the prolonged and ongoing recovery period [2].

Adults with arthritis have substantially lower employment and strikingly higher work disability compared with age- and sex-matched non-arthritis peers [4]. There is a considerable literature documenting negative employment consequences and work disability among adults with arthritis, particularly from condition-specific (often rheumatoid arthritis) perspectives [5–10], with comparatively fewer, but a growing number of, prospective studies examining predictors of work loss and related impacts in this population [10–13]. At this time, however, little is known about transitions in and out of employment among people with arthritis, particularly in the context of a major macroeconomic event like the Great Recession. In a condition-specific study of lupus, Yelin et al. found that high work loss and low work entry *both* contribute to low employment among female adults with lupus [10]; these findings suggest that a broader examination of work entry behaviors among people with arthritis is warranted, in addition to work loss, and indicates that a variety of different employment-related interventions, including policy interventions, are required to improve employment among people with arthritis.

People with arthritis-related work disabilities may be susceptible to the proposed phenomenon in which those with disabilities are among the last hired in times of prosperity and, conversely, among the first fired during economic downturns [3]. While sufficient follow-up data were not available at the time of his study to comment on the “last hired” portion of this hypothesis, Kaye presented compelling longitudinal evidence and concluded that, specifically during the 2007-2009 Recession, “people with disabilities are the first to be laid off” [3]. A previous population-based study examining changes in proportions and cross-sectional population trends of employment participation and work disability among age- and sex specific groups from 2002-2013 reported that, among those with arthritis, employment was always significantly lower and work disability was always significantly higher, compared with those without arthritis [4]. Additionally, the Great Recession had a significant and disproportionately negative impact among some of the arthritis groups [4]. Generally, the prevalence of work limitations and disabilities among people with arthritis (approximately 30% in a population-based study [14] and reaching up to 40% and 50% for some specific conditions [5]), highlights the need to know more about the effects of external forces on employment in this population. Given the implications for the relationship between arthritis and employment, there may be value in examining the possible impact of the Great Recession with a longitudinal data source.

The purpose of this study is to examine the association of arthritis status with employment (proportion working or not working) during the Great Recession among U.S. adults with and without arthritis. We further identify predictors of employment entry and employment exit among both groups and discuss whether these predictors are modifiable and/or present potential targets for intervention. We anticipated that employment exit will be higher and that entry will be lower among people with arthritis.

2. Methods

2.1. Study Sample

Data were obtained from the National Health Interview Survey (NHIS) for the baseline year of 2007 and from the Medical Expenditure Panel Survey (MEPS) Household Component for years 2008 and 2009 to incorporate the years of the Great Recession. MEPS survey participants are subsampled from NHIS participants from the prior year, and records of individuals were linked between NHIS and MEPS to allow longitudinal cohort analyses for follow-up years 2008 and 2009. Data linkage files were obtained from the Agency for Healthcare Research and Quality [15]. NHIS and MEPS are both conducted through in-person interview in the participant's home. NHIS is an on-going mutli-stage probability survey nationally representative of the U.S. civilian, noninstitutionalized population [16]. MEPS, which has a panel design including five interviews over two full calendar years, also provides nationally representative estimates [15].

Due to our interest in working-age adults, we restricted our analyses to adults between the ages of 30 and 62 who were interviewed as Sample Adults in NHIS and sampled into MEPS (n=3,277); a baseline maximum age of 62 allowed respondents to "age up" to 64 and prevented observations of employment exit at age 65, a traditional retirement age, which could have been a potential confounder in our sample. Participants between the ages of 18 and 29 were excluded for three reasons: 1) frequent unstable employment and high prevalence of transitory student status in this age group, 2) comparatively low population prevalence of arthritis, and 3) comparability with prior work which examined 30-64 year olds [4].

NHIS data were obtained from the Sample Adult file with linkage to the Person file for relevant variables [16]; data from MEPS were all from the Household Component Panel 13 Longitudinal file [15]. Response rates for NHIS 2007 participants sampled for MEPS and the MEPS 2008 and 2009 follow up periods were 88.1%, 58.8%, and 55.4%, respectively [17]. The MEPS Panel 13 Household Component was specifically subjected to an experiment in which households were randomized into groups receiving incentive payments of various levels after completion of each interview round. Findings showed that even the highest payment level did not change the demographics of participants across subsequent rounds of participation or when compared to a previous Panel [18]. Examined demographics included: education, race, age group, and employment, marital, and self-rated health status, indicating non-differential loss to follow-up within our sample.

2.2. Definitions

All baseline characteristics were ascertained from the 2007 NHIS. Self-Reported, doctor-diagnosed arthritis was defined as a "yes" response to "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?" Sociodemographic characteristics were: age (30-44, 45-54, 55-64 years), sex, race/ethnicity, and education (less than high school, high school graduate, some college, college graduate or higher). Additional personal characteristics were: health

insurance (yes/no) and marital status (married/cohabitating, divorced/separated/widowed, never married).

Health characteristics examined were comorbidities, Serious Psychological Distress, and key functional limitations. For comorbidities, root question wording was “Have you ever been told by a doctor or other health professional that you had…” for hypertension, stroke, coronary heart disease, angina, heart attack, any kind of heart condition or heart disease (other than queried separately), cancer, emphysema, and diabetes. Non-Melanoma skin cancer and gestational diabetes were excluded. Current asthma was identified by a “yes” to “do you still have asthma,” and chronic bronchitis was identified with a 12 months recall period for a doctor-diagnosis of the condition. The yes/no question “Do you have trouble seeing, even when wearing glasses or contact lenses?” was used to identify vision trouble. All non-arthritis comorbidities were summed to create a condition count representing the number of non-arthritis chronic conditions: none, 1, 2, ≥3. The Kessler-6 (K6) scale was used to identify Serious Psychological Distress (SPD), using six-questions (items: feeling sad, worthless, nervous, restless, hopeless, and that everything was an effort) with a recall period of 30 days. The K-6 was developed to identify and monitor prevalence and trends in nonspecific SPD at the population-level; reported values were summed to create a total score, and scores of ≥13 identified respondents with SPD [19]. In previous work, the clinical and functional importance of limitations affecting the lower extremity, upper extremity, mobility, and endurance were used to inform the creation of a combined variable to capture the most importance capacities available in the range of functional limitation variables in NHIS [20]. Using the same approach here, we created a key functional limitations variable based on a “very difficult” or “can’t do at all” response to any of: “By yourself, and without using any special equipment, how difficult is it for you to…” “lift or carry something as heavy as 10 pounds such as a full bag of groceries” (upper extremity mobility and strength), “stand or be on your feet for about 2 hours” (overall endurance), and “walk a quarter mile or 3 city blocks” (lower extremity mobility).

Employment status was ascertained at baseline from NHIS and classified as working (employed for pay with a job or business, including self-employed) or not working (all other categories). Over the following two years, 2008-2009, employment status was ascertained from MEPS at five interviews. Employment transitions (stopping or starting work) were also collected in MEPS at each interview as well as timing of transitions to identify the month in which any employment transition occurred.

2.3. Statistical analyses

Distributions (weighted proportions with 95% Confidence Intervals (CI)) of baseline characteristics by employment and arthritis status were generated using SAS 9.3 survey procedures to produce standard errors which accounted for the complex sample design of the survey [21]; adjusted sampling weights as described by Cohen were applied to all estimates to generate nationally representative estimates and to permit longitudinal cohort analyses with NHIS as baseline with 2-years follow-up in MEPS with appropriate adjustment of estimation weights [22]. Estimates with a relative standard error (RSE) of ≥30.0 were suppressed. Estimates with an RSE between 20.0 and 29.9 may be unstable and are flagged

in tables and footnotes. Statistically significant differences were conservatively defined as non-overlapping 95% CIs [23].

We used PROC LIFETEST in SAS to estimate Kaplan-Meier survival curves separately for our two outcomes: 1) stopping work for those working at baseline, and 2) starting work for those not working at baseline. The 95% CIs were generated in SUDAAN [24] in order to account for the complex sample survey design not accommodated by SAS for this procedure [25].

The proportional hazards assumption was confirmed graphically [25], and we proceeded to estimate risk factors for each outcome using Cox proportional hazards regression models with hazard ratios (HR) and 95% CI using PROC PHREG [25]. We first estimated unadjusted models for each outcome containing only arthritis status and the work outcome. Next, to explore the relationships between our main exposure of interested (arthritis status) and the potential predictors, we generated paired predictor models for each predictor variable for each work outcome containing arthritis status plus one additional predictor variable (Appendix Table).

Before generating fully adjusted models, we examined Spearman's correlation coefficients between the predictor variables. Absolute values for correlations ranged from virtually none (0.00) to modest (0.41), with the strongest correlation between key functional limitations and self-rated health. All potential predictors had either consistent (age, function) [5, 10, 12, 13, 26, 27] or ambiguous (sex, race/ethnicity, comorbidity, marital status, education, insurance, psychological characteristics, self-rated health) [10, 12, 13, 26, 28] relationships between arthritis and employment in the literature, so we proceeded with a multistaged approach to allow us to consider all potential predictors. Arthritis status was forced into all models. For each outcome separately, we first fit forward selection models (i.e., significant variables were sequentially added; significance in model building was set at $\alpha \leq 0.05$) for all potential predictors except key functional limitations (to avoid potential collinearity with self-rated health). We then repeated the process but exchanged self-rated health for key functional limitations. Next, we fit forward stepwise models for both outcomes with both key functional limitations and self-rated health as candidates in the same models. For good measure, we conducted the entire series of model generations again using backwards stepwise selection (i.e., non-significant variables were sequentially removed). All final models were the same regardless of approach used.

For starting work, we also generated an alternate model which excluded both key functional limitations and self-rated health as candidate variables in order to explore any additional potentially modifiable risk factors for starting work. We conducted the entire forward and backward selection model building process again for starting work. Three of these iterative models are presented in the results.

In order to have a comparison with work entry and exit during the Great Recession, we also estimated the unadjusted Cox proportional hazards regression models with hazard ratios (HR) and 95% CI for each work outcome for the time period immediately preceding the

Great Recession using the same methods as described above. The baseline year was 2004 from NHIS with the two year follow-up from years 2005 and 2006 in MEPS.

3. Results

Baseline

In 2007, the population prevalence of those 30-64 years old with arthritis was 20.1% (95% CI = 18.0-21.4) and without arthritis was 79.9% (95% CI = 78.6-81.2).[1] At baseline, 78.8% of those without arthritis were working (Table 1), while 21.2% were not working (Table 3). Correspondingly, for those with arthritis, 60.8% were working at baseline (Table 1), and 39.2% were not (Table 3).

3.1. Employment over the study period

Employment was substantially and significantly lower among adults with arthritis compared with those without arthritis at all time points (Figure 1). Employment for both groups declined, particularly in mid- to late-2009, dropping 3.3% percentage points for those without arthritis (baseline = 79.9%, 95% CI = 78.0-81.9; December 2009 = 76.6%, 95% CI = 74.7-78.6) and 6.0% percentage points for those with arthritis (baseline = 61.4%, 95% CI = 56.4-66.5; December 2009 = 55.4%, 95% CI = 50.5-60.4). Despite these declines in employment, these losses were not statistically significant for either group.

3.1.1. Employment transitions over the study period—A substantial majority of those in both groups made no employment transitions. A significantly greater proportion of 30-64 year old adults with arthritis made one employment transition compared with those without arthritis (Figure 2).

3.2. Stopping work

Descriptions of selected characteristics for the population employed at baseline are shown in Table 1. Those with arthritis were significantly older and more often female and white compared with those without arthritis. Education and marital status distributions were similar between groups with no significant differences. SPD was low prevalence for both groups. People with arthritis reported ≥3 non-arthritis comorbidities five times more often, fair/poor health more than twice as often, and key functional limitations eight times more often than those without arthritis.

Figure 3 shows the time until work loss among both groups for those employed at baseline. Rate of work loss was significantly greater for those with arthritis compared with those without arthritis starting at month 30 (~July 2009) and continuing through the remainder of the study period. By the end of the study period, 16.8% (95% CI = 14.9-18.9) of those without arthritis and 27.0% (95% CI = 21.8-32.9) of those with arthritis stopped work.

In the unadjusted model, arthritis was significantly associated with 70% greater risk of stopping work (HR = 1.7, 95% CI = 1.3-2.2) (Table 2). Arthritis remained significantly

[1]Longitudinal sampling weights applied. This is the estimated U.S. population prevalence. This population is presented, as labeled, in all tables and figures throughout the paper.

associated with increased risk of stopping work in all paired predictor models (Appendix Table). In the fully adjusted model, arthritis was significantly associated with 50% greater risk of stopping work (HR = 1.5, 95% CI = 1.1-2.0) (Table 2). Other significant predictors were older age, 55-65 years (HR = 1.5, 95% CI = 1.1-2.1), Non-Hispanic Black race/ethnicity (HR = 1.4, 95% CI = 1.1-1.8), high school/GED (HR = 1.4, 95% CI = 1.1-1.9), being divorced/separated/widowed (HR = 1.4, 95% CI = 1.1-1.8), and good self-rated health (HR = 1.4, 95% CI = 1.1-1.9). Interestingly, fair/poor self-rated health did not reach statistical significance for stopping work. Having health insurance was protective for work loss (HR = 0.6, 95% CI = 0.5-0.9).

In the time period immediately preceding the Great Recession, there was no difference in work exit between those with and without arthritis: unadjusted HR = 1.3, 95% CI = 1.0-1.8) for those with arthritis compared with those without arthritis as the referent group. Since arthritis was significantly associated with 70% greater risk of stopping work during the Great Recession, a differential effect of the recession on people with arthritis is suggested. (Appendix Figure 1)

3.3. Starting work

Table 3 shows selected characteristics for the population not employed at baseline. Those with arthritis were significantly older, more often white, and more often divorced/separated/widowed. Proportions of men and women were nearly identical for those with and without arthritis. Those with arthritis reported no comorbidities half as often, 2 comorbidities twice as often, ≥3 comorbidities almost three times as often, SPD ≥3 times as often, fair/poor self-rated health more than twice as often, and key functional limitations more than 4 times as often compared with people without arthritis. Only half as many people with arthritis reported no health insurance compared with those without arthritis.

Figure 4 shows the time until work entry among both groups for those not employed at baseline. Rate of work entry was significantly lower for those with arthritis compared with those without arthritis for most of the study period, from month 11 until month 30 (~December 2007-~July 2009). By the end of the study period, 38.7% (95% CI = 33.8-43.8) of those without arthritis and 24.8% (95% CI = 18.6-32.3) of those with arthritis started work, i.e., a significantly lower proportion among those with arthritis entered work.

In the unadjusted model, arthritis was significantly associated with 40% lower chance of starting work (HR = 0.6, 95% CI = 0.4-0.8). Arthritis remained significantly associated with lower chance of entering work in paired predictor models for sex, race/ethnicity, education, SPD, insurance, and marital status, and was not significant in paired predictor models for age, comorbidities, key functional limitations, or self-rated health (Appendix Table). Three iterative models demonstrating snapshots of the model selection process are presented in Table 4. These models start with adjustment for arthritis, all of the predictors from the paired predictor models in which arthritis remained significant (sex, race/ethnicity, education, SPD, insurance, and marital status) and one predictor, comorbidities, from the paired predictor models in which arthritis was not a significant predictor for work entry. In this first model, the HR for the presence of arthritis continued to demonstrate a negative effect on work entry (HR = 0.9, 95% CI=0.6-1.3), but the estimate was no longer statistically significant.

In the second of the 3 models presented in Figure 4, model building has proceeded via the selection process described above to result in a model consisting of: arthritis, age, education comorbidities, and health insurance. In this model, the association of arthritis with starting work is null: HR = 1.0, 95% CI = 0.7-1.6 In the final model presented, adjusting for arthritis, age, sex, key functional limitations, and self-rated health, people with arthritis were more likely to start work, but the estimate was not statistically significant (HR = 1.5, 95% CI = 1.0-2.2) (Table 4). Older age, female sex, and fair/poor self-rated health were all associated with between 40% and 70% lower chance of starting work.

In the time period immediately preceding the Great Recession, there was a difference in work entry between those with and without arthritis: unadjusted HR = 0.5, 95% CI = 0.4-0.7 for those with arthritis compared with those without arthritis as the referent group. However, this relationship was almost identical during the Great Recession (HR = 0.6, 95% CI = 0.4-0.8), so no enhanced effect of the Great Recession on starting work among people with arthritis was demonstrated. (Appendix Figure 2.)

4. Discussion

We confirmed that employment was lower for adults with arthritis compared with non-arthritis peers from a population-based perspective. During the Great Recession, people with arthritis stopped work at higher rates and started work at lower rates than those without arthritis. The significant increase in stopping work among those with arthritis during the Great Recession indicated that there was at least some differential effect among those with arthritis. At the same time, the relationship between arthritis and starting work remained consistent with the time period immediately prior to the Great Recession. Additional findings regarding significant predictors for stopping and starting work were mixed and, importantly, revealed that somewhat different sets of characteristics were meaningful for each work outcome.

While age itself is not modifiable, age 55-64 years was the one predictor that was significant for both work outcomes. Individuals in this age group stopped work 50% more often and started work 70% less often compared with the youngest respondents. The importance of age with regard to employment suggests that individual-level interventions may be most effective when complemented by social or policy interventions that incentivize employment of this population from the employer and social perspective. Findings from Canada and Europe provide some examples regarding employment of individuals with chronic illness: these individuals do not fare well in terms of employment in deregulated markets; generous welfare benefits do not cause a disincentive to work; and active labor market policies to encourage work are partially supportive [29]. Careful examination of policy consequences are especially important from the standpoint of minimizing disparities in marginalized groups that seem to be widening with growing deindustrialization; for example, Holland et al. found increasing inequality between healthy and chronically ill people throughout periods of both economic recessions and recoveries in the 1980s, 1990s, and 2000s [30]. Given some of the recognized patterns of excessive employment loss among people with disabilities during these recession and recovery and recovery periods, more research is currently being done to establish the within-organization effects of macro financial crises.

The aims of such work are to follow the direct and long-term aftermath of these events and to have practical application in informing prevention and rehabilitation initiatives [31].

The relationship of self-rated health with both work outcomes and particularly between poor self-rated health and lower risk of starting work suggests that clinical and public health interventions which improve health status may also improve the ability of individuals with and without arthritis to maintain or gain employment. The strong adverse effect of key functional limitations for starting work also suggests that those not working do have substantial physical limitations which could benefit from additional management. Finally, while education was only predictive of stopping work for those with high school level education, there have been previous reports of the importance of education [26, 27] as it relates to employment. Given the myriad of benefits associated with greater education, it seems a worthy intervention point, particularly if job skills or training could be incorporated.

At the same time, wider application of job accommodation strategies could offer opportunities for more immediate employment retention or attainment. Despite persistent perceptions to the contrary, approximately half of employee accommodations are at no cost to employers, who benefit from increasing worker productivity and profitability and improving company morale [32]. The Americans With Disabilities Act (ADA) does mandate employer–provided “reasonable accommodations.” Encouragingly, accommodations are known to assist people with disabilities be employed [32–34]. However, the ADA provides no specific definition or parameters to define “reasonable accommodations,” leaving the interpretation to be made on a case-by-case basis. Unfortunately, recent scoping reviews covering dozens of studies have found several negative unintended consequence of this necessary ambiguity [33, 35]. For example, employers cite lack of knowledge and familiarity with applying the ADA as reasons to avoid employees and situations where they might be needed [33]. Fear of potential accommodation costs, losses to training time, and potential litigation are also deterrents [35, 36]. Despite ADA protections, employees and employers still report discrimination as an employment barrier for people with disabilities [35, 36]. People with disabilities may be especially vulnerable to work barriers and negative pressures during times of economic contraction and recovery when employers may be particularly sensitive to perceived financial threats.

Sex and marital status were not consistently associated with work outcomes. Workforce patterns traditionally differ between men and women due to childrearing and other social forces [37], women typically have higher prevalence of arthritis [38], and women with arthritis consistently fare worse compared with men with arthritis in terms of employment [39]. Therefore, it was mildly surprising that sex was only a significant predictor as adverse for starting work among women (HR=0.6, 95%CI=0.4-0.9) and not also stopping work. Marital status had a significant effect for stopping work among those who were divorced/separated/widowed (HR=1.4, 95%CI=1.1-1.8) but not among those who were never married.

During the model building process, we observed an interesting, although not entirely unexpected, finding. In adjusted models, the presence of multiple non-arthritis comorbidities, key functional limitations, or self-rated health caused the association of arthritis with the outcome of starting work to flip from being adverse (i.e., lower work

entry among those with arthritis) to being associated with a greater, although not statistically significant, chance of starting work. Yelin demonstrated this phenomenon in 1995 when he documented that “after adjusting for demographic and functional characteristics, persons with musculoskeletal conditions actually are more likely to work than those without” [28]. He further went on to describe that poor employment in this group was limited to those with poor functional status and due almost entirely to this characteristic. Our adjusted models reflect this same phenomenon and demonstrate that decrements in function and self-rated health are main mechanisms through which arthritis impacts employment participation, particularly work entry.

Importantly, these findings do not diminish the relationship between arthritis and employment, including that for work entry, which we have documented not only during the period of the Great Recession but also during the reference period preceding the recession (2004-2006); they simply suggest primary pathways of action through which this relationship occurs. A Bureau of Labor Statistics study documented that the 2007-2009 recession particularly affected workers with disabilities and disproportionately affected workers with mobility impairments and those with difficulty performing routine daily activities [3]. Such a report independently bolsters hypotheses of underlying causal patterns of the interface between arthritis, physical impairments, and employment and provides evidence, particularly during this time period, of population-wide effects among people, such as those with arthritis, for whom mobility and activity limitations are common [3, 38]. An instructive and informative direction for future research would be a mediation analysis to examine the independent and interrelated contributions of arthritis, functional limitations, self-rated health, and the presence of multiple comorbidities with employment outcomes [40].

5. Strengths and limitations

Findings from our study are subject to the limitations of self-report, as all data were ascertained this way. The case-finding question for arthritis, however, has been demonstrated to perform well for public health surveillance purposes [41]. Next, although not strictly a limitation, as with any non-experimental design, some care must be taken in interpretation of the research findings. Despite addressing the problem of temporal sequencing of potential predictors through longitudinal analysis, this remains a quasi-experimental, observational study design.

This study also has important strengths. Movements into employment among those not employed at baseline are mostly missing in the literature and patterns or triggers related to these movements are currently unexplored in a systematic, population-based approach. Our findings demonstrate that work stopping and starting are influenced by mostly different characteristics, and point to a variety of individual, clinical, social, and policy-level interventions to address specific needs of these two groups. We also used a nationally representative, population-based perspective to examine employment transitions among working-age adults with and without arthritis with longitudinal data and demonstrated different rates of work exit and entry among those with arthritis. Examination of this relationship included taking advantage of a natural experiment (Great Recession) to study

the effects of a global macroeconomic effect on the relationship between arthritis and employment.

6. Conclusions

While some debate remains, there is good evidence that appropriate work is beneficial in terms of physical and mental health [42, 43] and that being outside of the workforce has negative physical, emotional, and financial consequences [42, 44]. Our findings suggest important group differences for those with and without arthritis and point to intervention targets for improving employment entry and decreasing employment exit. While our findings are reported for an extreme economic period, amid the labor force pressures exerted by the Great Recession, these stresses are likely to magnify existing arthritis-disability-employment relationships, rather than introduce entirely new patterns. Also, as described above, some of these patterns are predictable based on effects of previous recessions, and these data can help contribute to planning efforts for prevention or minimization of disproportionate effects of future economic events on employment for people with arthritis.

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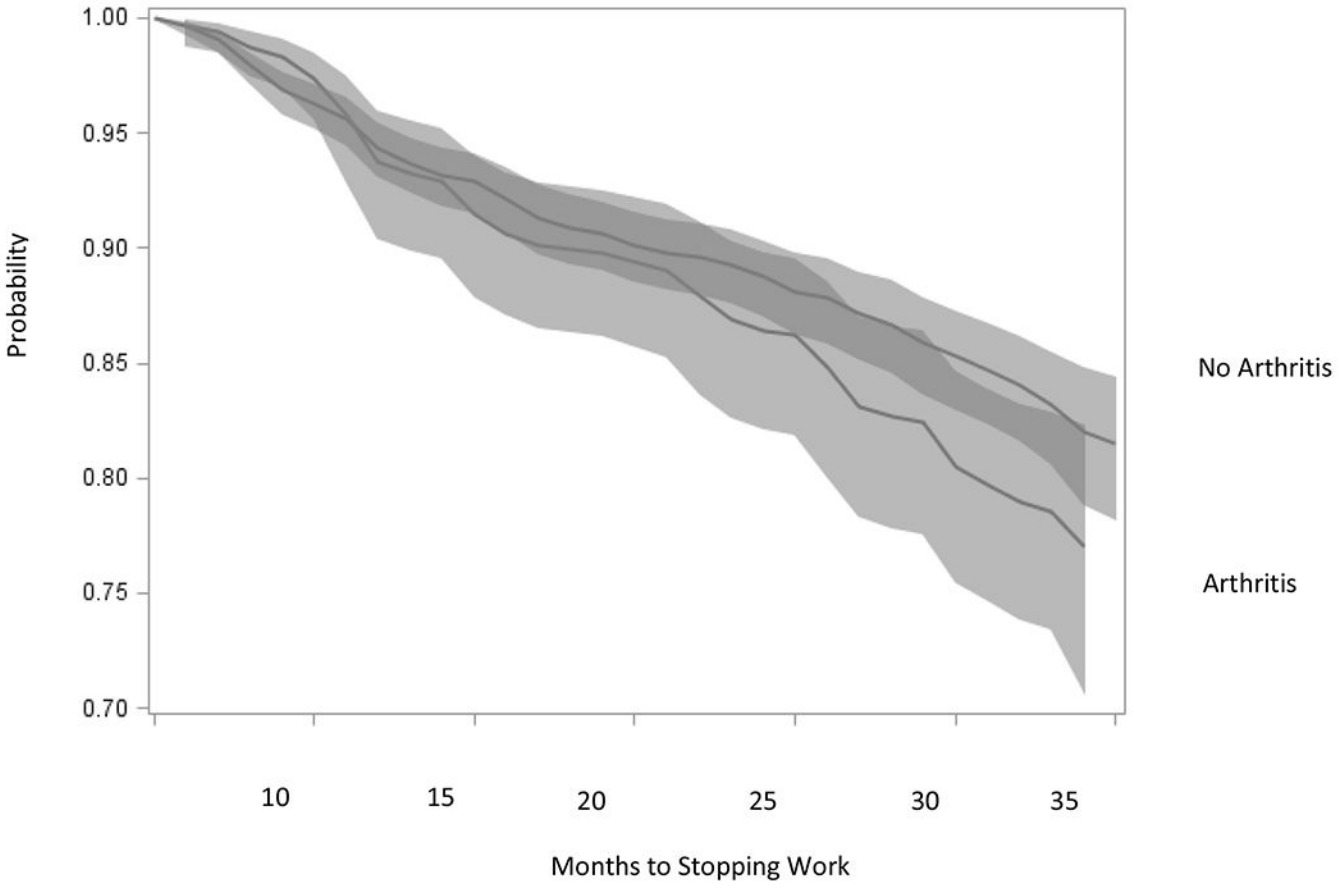
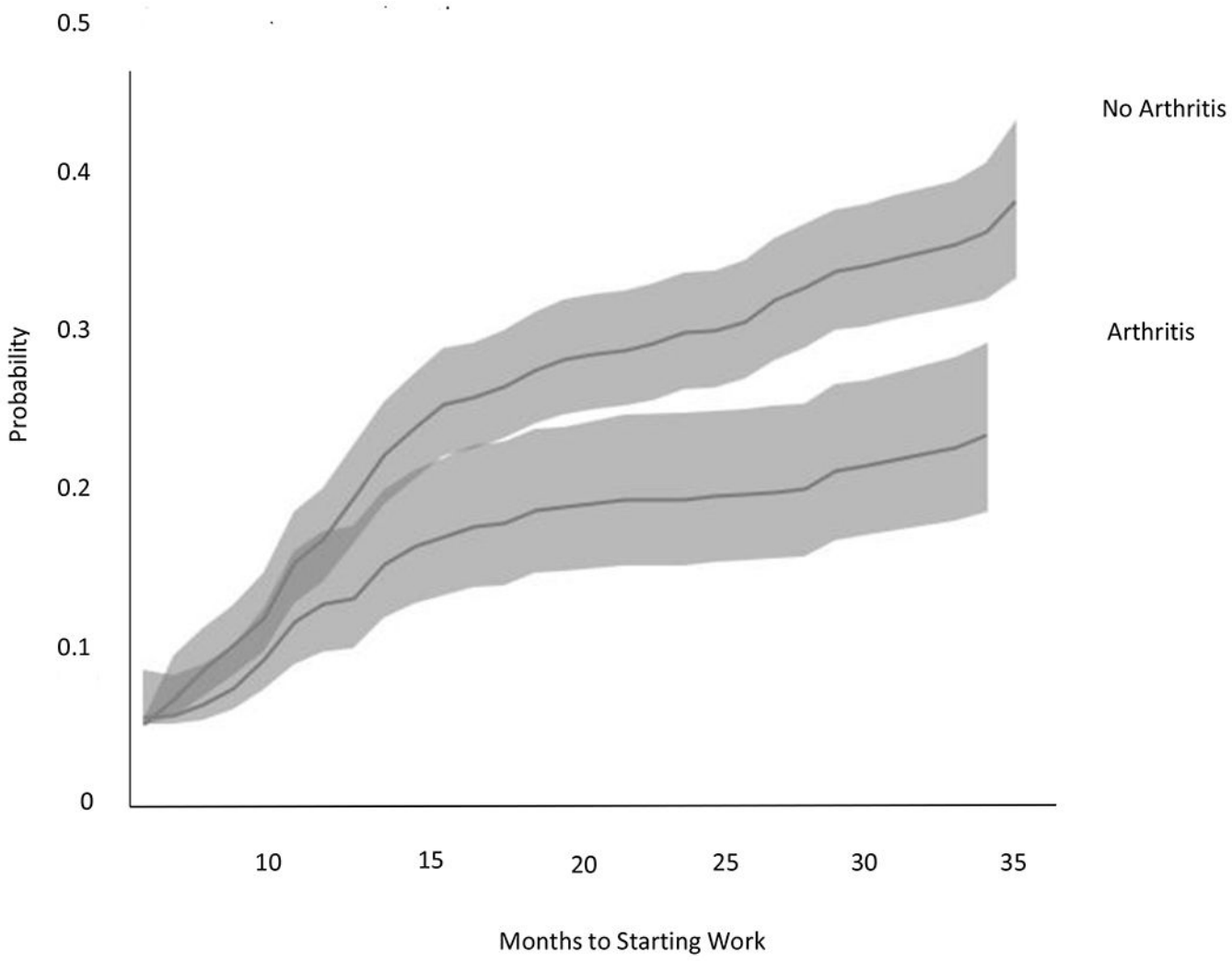
Disclaimer:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Appendix



Appendix Figure 1.
Probability with 95% confidence intervals of stopping work in 2005-2006 among those employed in 2004, time in months, by arthritis status



Appendix Figure 2.
Probability with 95% confidence intervals of starting work in 2005-2006 among those not working in 2004, time in months, by arthritis status

Appendix Table.

Hazard Ratios with 95% Confidence Intervals (CI) over 2008-2009 follow-up, Paired-Predictor Models, ages 30-64

Stopping work among those working at baseline (NHIS 2007)			**Starting work among those NOT working at baseline (NHIS 2007)**	
	HR	**95% CI**	**HR**	**95% CI**
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.6	(1.2-2.0)	0.8	(0.5-1.1)
Age				

Stopping work among those working at baseline (NHIS 2007)			Starting work among those NOT working at baseline (NHIS 2007)	
	HR	**95% CI**	**HR**	**95% CI**
30-44 years	1.0	(1.0-1.0)	1.0	(1.0-1.0)
45-54 years	0.9	(0.7-1.2)	0.8	(0.6-1.1)
55-64 years	1.5	(1.1-2.1)	0.4	(0.2-0.5)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)	0.6	(0.4-0.8)
Sex				
Male	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Female	0.9	(0.7-1.2)	0.8	(0.6-1.1)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.8	(1.4-2.3)	0.6	(0.4-0.8)
Race/Ethnicity				
Non-Hispanic White	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Hispanic	1.6	(1.3-2.2)	1.0	(0.7-1.4)
Non-Hispanic Black	1.5	(1.2-2.0)	1.0	(0.7-1.4)
Non-Hispanic Other	1.3	(0.8-2.1)	1.2	(0.7-2.1)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)	0.6	(0.4-0.9)
Education				
Less than high school	2.1	(1.5-3.0)	0.7	(0.5-1.1)
High school grad	1.7	(1.3-2.2)	0.7	(0.5-1.0)
Some college	1.4	(1.1-1.9)	1.0	(0.7-1.6)
College grad or more	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.6	(1.2-2.0)	0.8	(0.5-1.1)
# Non-Arthritis chronic conditions				
None	1.0	(1.0-1.0)	1.0	(1.0-1.0)
1	1.2	(0.9-1.6)	0.7	(0.5-0.9)
2	1.3	(0.9-1.9)	0.5	(0.3-0.8)
≥3	1.7	(1.0-2.7)	0.3	(0.2-.05)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)	0.6	(0.4-0.8)
Serious Psychological Distress				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)

Stopping work among those working at baseline (NHIS 2007)			Starting work among those NOT working at baseline (NHIS 2007)	
	HR	**95% CI**	**HR**	**95% CI**
Yes	1.0	(0.5-2.0)	0.9	(0.5-1.6)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)	0.9	(0.6-1.4)
Key Functional Limitation				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.2	(0.7-2.1)	0.3	(0.2-0.4)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.8	(1.4-2.3)	0.6	(0.4-0.9)
Health Insurance				
Yes	1.0	(1.0-1.0)	1.0	(1.0-1.0)
No	2.0	(1.5-2.6)	1.8	(1.3-2.6)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)	0.6	(0.4-0.8)
Marital status				
Married/Living with partner	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Divorced/Separated/Widowed	1.6	(1.3-2.1)	0.8	(0.6-1.2)
Never married	1.1	(0.8-1.5)	1.0	(0.7-1.6)
Arthritis				
No	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Yes	1.5	(1.1-2.0)	0.8	(0.5-1.1)
Self-Rated health				
Excellent/Very good	1.0	(1.0-1.0)	1.0	(1.0-1.0)
Good	1.7	(1.3-2.2)	0.9	(0.7-1.3)
Fair/Poor	1.9	(1.3-2.9)	0.4	(0.2-0.6)

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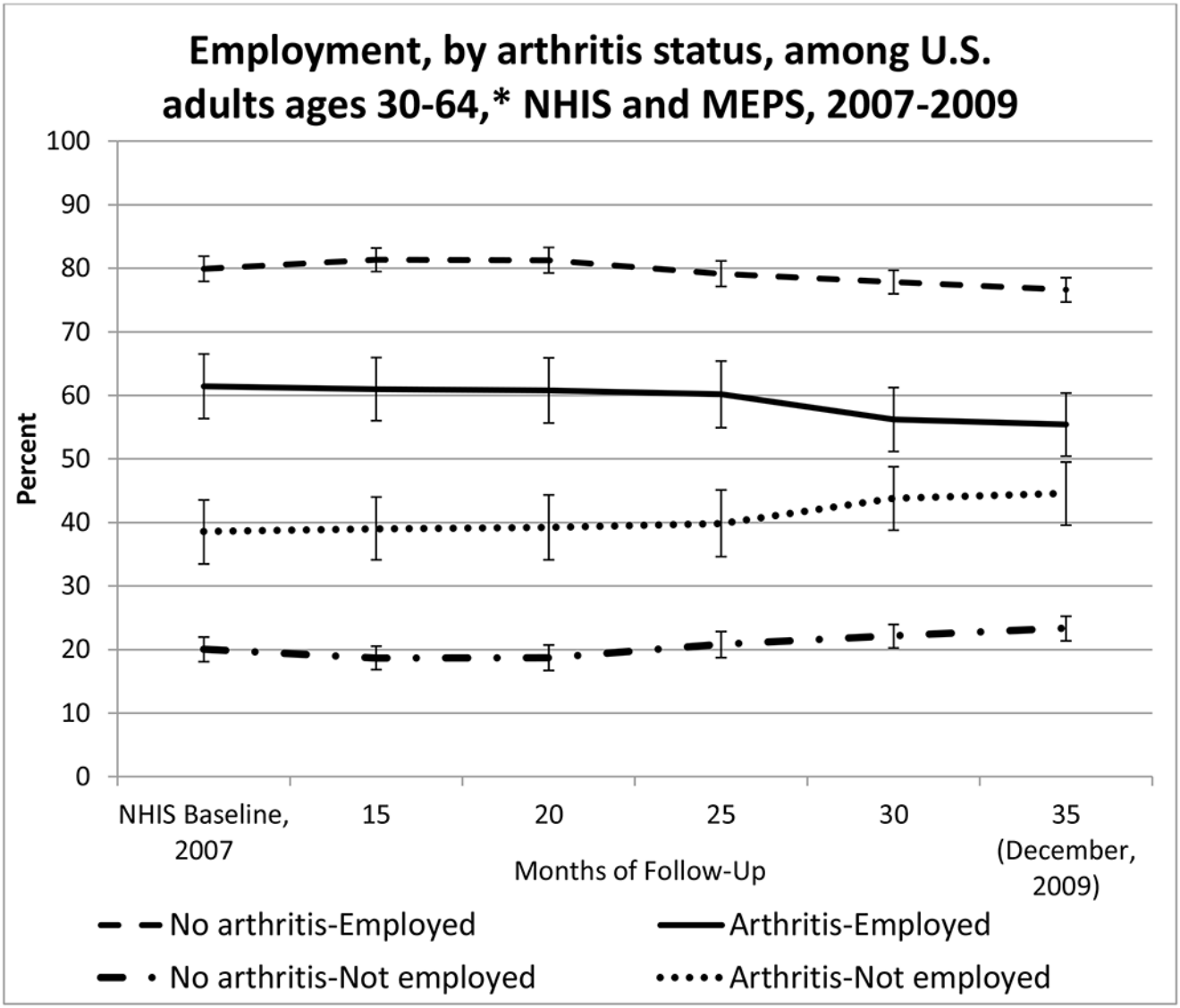

Figure 1.

NOTE: *The oldest participants were 62 years old at baseline and aged up to age 64 over the course of the 2-year follow-up.

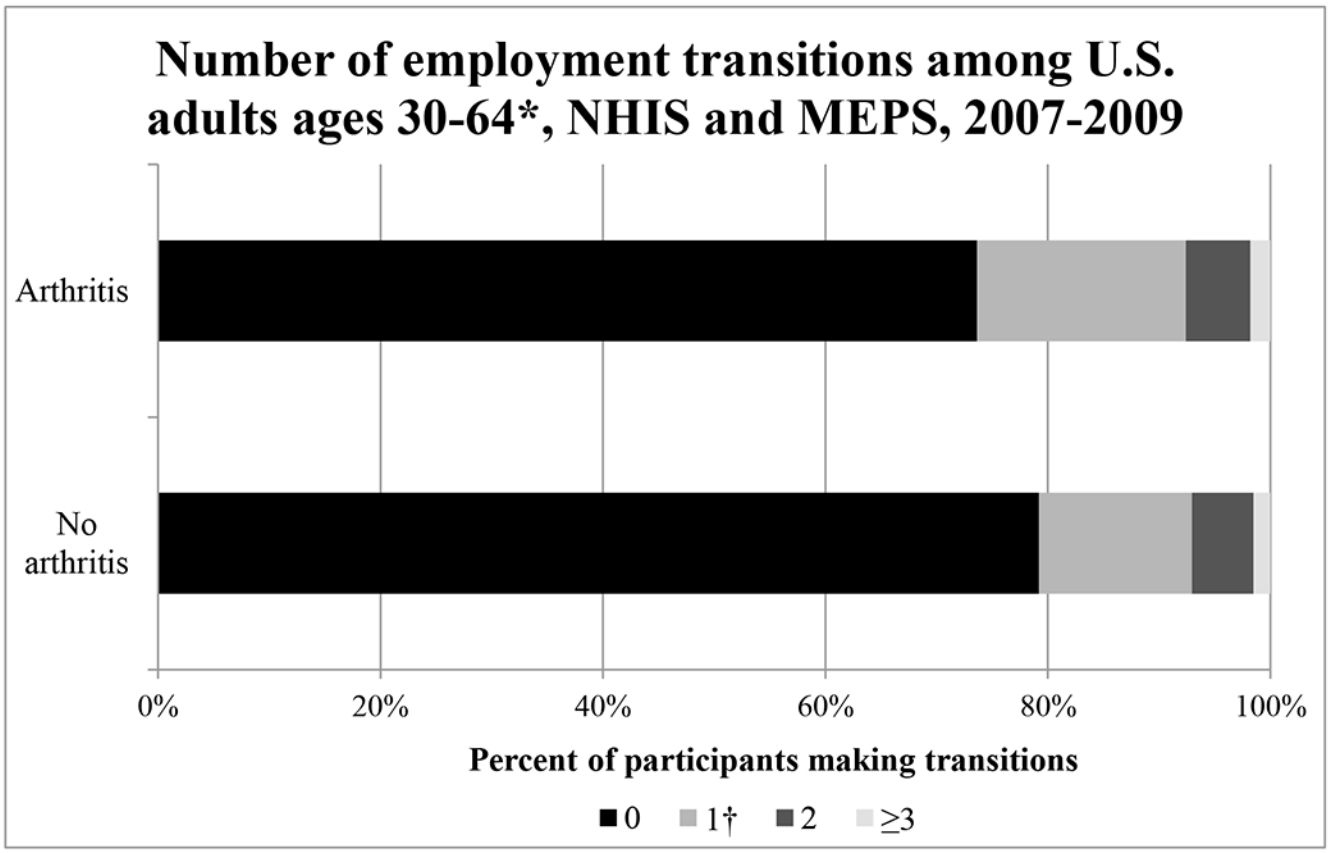

Figure 2.

* The oldest participants were 62 years old at baseline and aged up to age 64 over the course of the 2-year follow-up.

†Significant difference in 1 transition.

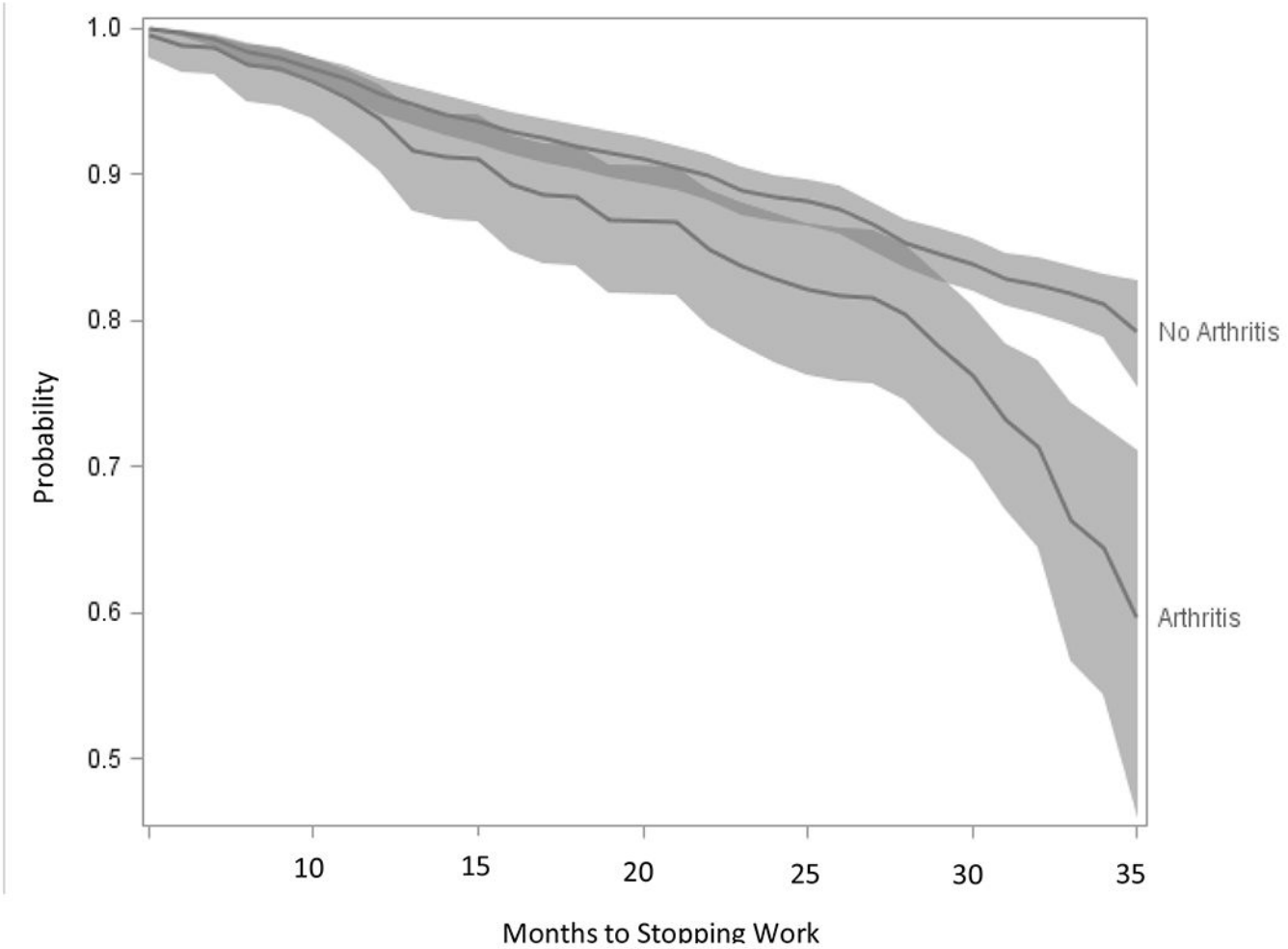

Figure 3.
Probability with 95% confidence intervals of stopping work in 2008-2009 among those employed in 2007, time in months, by arthritis status

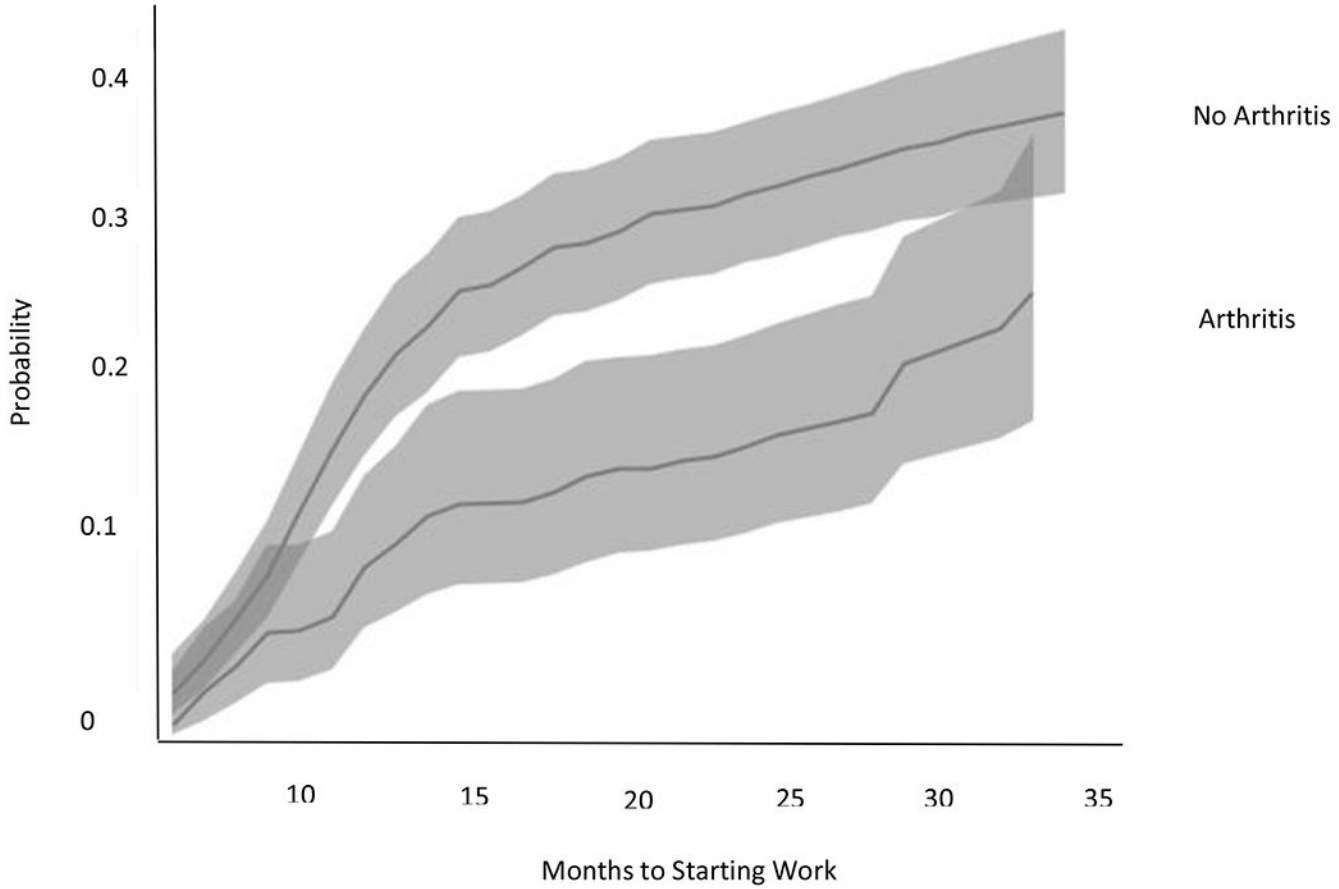

Figure 4.
Probability with 95% confidence intervals of starting work in 2008-2009 among those not working in 2007, time in months, by arthritis status

Table 1.

Distribution of population characteristics at baseline among those working in 2007, by arthritis status, NHIS

	No Arthritis				Arthritis			
	Number of Respondents	**Weighted Population in 1,000s**	**%**	**95% CI**	**Number of Respondents**	**Weighted Population in 1,000s**	**%**	**95% CI**
Total percent working	1,963	90,565	78.8	(77.0-80.5)	366	17,623	60.8	(57.2-64.4)
Age (years)								
30-44	1,062	45,790	51.6	(49.3-53.8)	114	5,163	30.6	(25.1-36.0)
45-54	604	30,745	34.6	(32.4-36.9)	132	6,760	40.0	(34.7-45.3)
55-62	259	12,254	13.8	(12.1-15.5)	103	4,973	29.4	(25.3-33.5)
Sex								
Men	980	50,081	55.3	(53.0-57.6)	141	8,645	49.1	(43.7-54.4)
Women	983	40,484	44.7	(42.4-47.0)	225	8,978	50.9	(45.6-56.3)
Race/Ethnicity								
Non-Hispanic White	913	62,617	69.1	(66.9-71.4)	203	13,394	76.0	(71.6-80.4)
Non-Hispanic Black	424	10,631	11.7	(10.2-13.3)	90	1,913	10.9	(8.0-13.7)
Hispanic	492	11,499	12.7	(11.2-14.2)	57	1,668	9.5	(6.5-12.4)
Non-Hispanic Other	134	5,819	6.4	(5.3-7.6)	*	*	*	*
Education								
Less than high school	337	9,522	10.5	(9.2-11.8)	44	1,416	8.0†	(4.7-11.4)
High school graduate	495	22,765	25.1	(23.1-27.2)	111	6,011	34.1	(29.0-39.3)
Some college	333	14,151	15.6	(13.9-17.4)	60	2,663	15.1	(12.0-18.2)
College grad or more	798	44,128	48.7	(46.3-51.1)	151	7,534	42.8	(37.2-48.3)
# Non-Arthritis chronic conditions								
0	1240	56,748	62.7	(60.5-64.9)	137	6,914	39.2	(35.0-43.5)
1	521	25,281	27.9	(25.8-30.0)	125	6,029	34.2	(29.7-38.7)
2	163	6,813	7.5	(6.4-8.6)	65	2,841	16.1	(12.8-19.5)
≥3	39	1,723	1.9	(1.2-2.6)	39	1,838	10.4	(7.5-13.4)
Serious Psychological Distress								
No	1910	88,380	99.1	(98.7-99.4)	349	17,034	97.1	(95.4-98.8)
Yes	25	821	0.9	(0.6-1.3)	*	*	*	*
Health insurance								
Yes	1572	76,967	85.2	(83.6-86.9)	325	16,201	91.9	(89.8-94.1)
No	385	13,345	14.8	(13.1-16.4)	41	1,422	8.1	(5.9-10.2)
Marital status								
Married/Living with partner	1143	64,173	71.2	(69.1-73.2)	203	12,425	70.5	(66.4-74.7)

	No Arthritis				Arthritis			
	Number of Respondents	Weighted Population in 1,000s	%	95% CI	Number of Respondents	Weighted Population in 1,000s	%	95% CI
Divorced/ Separated/ Widowed	446	14,188	15.7	(14.3-17.2)	109	3,391	19.3	(16.1-22.4)
Never married	363	11,774	13.1	(11.4-14.8)	53	1,797	10.2	(7.2-13.2)
Self-Rated health								
Excellent/Very good	1268	63,418	70.0	(67.9-72.2)	169	9,072	51.5	(47.3-55.7)
Good	550	21,807	24.1	(22.1-26.1)	135	6,333	35.9	(31.7-40.2)
Fair/Poor	144	5,316	5.9	(4.9-6.8)	62	2,218	12.6	(9.6-15.6)
Key functional limitations								
No	1923	89,242	98.5	(98.0-99.1)	313	15,379	87.3	(83.7-90.8)
Yes	40	1,323	1.5	(0.9-2.0)	53	2,243	12.7	(9.2-16.3)

[*] Estimate has a relative standard error (RSE) ≥30.0 and is suppressed.

[†] Estimate has a RSE between 20.0 and 29.9 and should be interpreted with caution.

NOTE: Some characteristic distributions may not add to 100.0 due to rounding.

The oldest participants were 62 years old at baseline and aged up to age 64 over the course of the 2-year follow-up.

Table 2.

Hazard Ratios with 95% Confidence Intervals (CI) for stopping work in 2008-2009 among those working at baseline (NHIS 2007), ages 30-64

	HR	95% CI
Unadjusted		
Arthritis		
No	1.0	(1.0-1.0)
Yes	1.7	(1.3-2.2)
Adjusted		
Arthritis		
No	1.0	(1.0-1.0)
Yes	1.5	(1.1-2.0)
Age		
30-44 years	1.0	(1.0-1.0)
45-54 years	0.9	(0.7-1.2)
55-64 years	1.5	(1.1-2.1)
Race/Ethnicity		
Non-Hispanic White	1.0	(1.0-1.0)
Hispanic	1.3	(1.0-1.8)
Non-Hispanic Black	1.4	(1.1-1.8)
Non-Hispanic Other	1.2	(0.7-2.0)
Education		
Less than high school	1.5	(1.0-2.1)
High school/GED	1.4	(1.1-1.9)
Some college	1.3	(1.0-1.7)
College grad or more	1.0	(1.0-1.0)
Health insurance		
No	1.0	(1.0-1.0)
Yes	0.6	(0.5-0.9)
Marital status		
Married/Living with partner	1.0	(1.0-1.0)
Divorced/Separated/Widowed	1.4	(1.1-1.8)
Never married	1.0	(0.8-1.4)
Self-Rated Health		
Excellent/Very good	1.0	(1.0-1.0)
Good	1.4	(1.1-1.9)
Fair/Poor	1.4	(1.0-2.2)

Table 3.

Distribution of population characteristics at baseline among those not working in 2007 by arthritis status, NHIS

	No Arthritis				Arthritis			
	Number of Respondents	**Weighted Population in 1,000s**	**%**	**95% CI**	**Number of Respondents**	**Weighted Population in 1,000s**	**%**	**95% CI**
Total	651	24,419	21.2	(19.5-23.0)	297	11,349	39.2	(35.6-42.8)
Age (years)								
30-44	306	10,338	47.0	(41.8-52.3)	53	1,903	19.2	(14.8-23.6)
45-54	163	6,154	28.0	(23.9-32.1)	89	3,069	31.0	(25.3-36.6)
55-62	132	5,492	25.0	(20.5-29.5)	117	4,943	49.9	(43.4-56.3)
Sex								
Men	199	8,791	36.0	(31.6-40.4)	96	3,725	32.8	(27.6-38.0)
Women	452	15,628	64.0	(59.6-68.4)	201	7,624	67.2	(62.0-72.4)
Race/Ethnicity								
Non-Hispanic White	265	14,814	60.7	(56.1-65.3)	166	8,838	77.9	(74.2-81.6)
Non-Hispanic Black	166	3,445	14.1	(11.7-16.5)	85	1,528	13.5	(10.8-16.1)
Hispanic	171	4,204	17.2	(14.0-20.4)	42	837	7.4	(5.0-9.8)
Non-Hispanic Other	49	1,955	8.0	(5.8-10.3)	*	*	*	*
Education								
Less than high school	202	5,143	21.1	(17.6-24.5)	88	2,240	19.7	(15.7-23.8)
High school graduate	176	7,344	30.1	(25.7-34.5)	93	4,598	40.5	(34.3-46.7)
Some college	112	4,331	17.7	(14.5-20.9)	52	1,785	15.7	(12.1-19.4)
College grad or more	161	7,600	31.1	(26.7-35.6)	64	2,726	24.0	(18.6-29.5)
# Non-Arthritis chronic conditions								
0	315	12,192	49.9	(45.5-54.3)	54	2,602	22.9	(17.0-28.9)
1	179	7,024	28.8	(24.7-32.8)	88	3,282	28.9	(24.2-33.7)
2	83	2,912	11.9	(9.2-14.7)	63	2,453	21.6	(16.8-26.5)
≥3	74	2,292	9.4	(7.3-11.5)	92	3,012	26.5	(21.4-31.7)
Serious Psychological Distress								
No	606	22,938	95.6	(94.1-97.0)	247	9,554	85.2	(81.7-88.8)
Yes	33	1,058	4.4	(3.0-5.9)	47	1,655	14.8	(11.2-18.3)
Health insurance								
Yes	439	16,975	69.7	(65.5-73.9)	250	9,560	85.0	(80.7-89.3)
No	211	7,374	30.3	(26.1-34.5)	46	1,686	15.0	(10.7-19.3)
Marital status								
Married/Living with partner	371	17,387	71.7	(68.2-75.2)	136	7,591	67.1	(62.5-71.7)

	No Arthritis				Arthritis			
	Number of Respondents	**Weighted Population in 1,000s**	**%**	**95% CI**	**Number of Respondents**	**Weighted Population in 1,000s**	**%**	**95% CI**
Divorced/ Separated/ Widowed	160	4,052	16.7	(13.9-19.6)	116	2,840	25.1	(21.3-28.9)
Never married	114	2,805	11.6	(9.1-14.1)	44	883	7.8	5.3-10.3)
Self-Rated health								
Excellent/Very good	298	13,181	54.0	(49.0-59.0)	47	2,185	19.3	(13.9-24.6)
Good	191	5,820	23.9	(20.2-27.5)	75	3,245	28.6	(23.2-34.0)
Fair/Poor	161	5,397	22.1	(18.4-25.8)	175	5,920	52.2	(45.8-58.5)
Key functional limitations								
No	541	21,048	86.2	(83.4-89.0)	120	4,882	43.0	(36.9-49.1)
Yes	110	3,371	13.8	(11.0-16.6)	177	6,467	57.0	(50.9-63.1)

* Estimate has a relative standard error (RSE) ≥30.0 and is suppressed.

NOTE: Some characteristic distributions may not add to 100.0 due to rounding.

The oldest participants were 62 years old at baseline and aged up to age 64 over the course of the 2-year follow-up.

Table 4.

Hazard Ratios with 95% Confidence Intervals (CI) for starting work in 2008-2009 among those not working in NHIS 2007, ages 30-64: Unadjusted arthritis predictor model and 3 Iterative adjusted predictor models to demonstrate attenuation of association between arthritis and other predictors with the outcome

Unadjusted		
Arthritis	**HR**	**95% CI**
No	1.0	(1.0-1.0)
Yes	0.6	(0.4-0.8)

Iterative Model 1			Iterative Model 2			Iterative Model 3		
Adjusted	**HR**	**95% CI**	**Adjusted**	**HR**	**95% CI**	**Adjusted**	**HR**	**95% CI**
Arthritis			**Arthritis**			**Arthritis**		
No	1.0	(1.0-1.0)	No	1.0	(1.0-1.0)	No	1.0	(1.0-1.0)
Yes	0.9	(0.6-1.3)	Yes	1.0	(0.7-1.6)	Yes	1.5	(1.0-2.2)
Sex						**Sex**		
Male	1.0	(1.0-1.0)				Male	1.0	(1.0-1.0)
Female	0.8	(0.6-1.1)				Female	0.6	(0.4-0.9)
			Age			**Age**		
			30-44 years	1.0	(1.0-1.0)	30-44 years	1.0	(1.0-1.0)
			45-54 years	1.0	(0.7-1.3)	45-54 years	0.9	(0.6-1.2)
			55-64 years	0.4	(0.3-0.7)	55-64 years	0.3	(0.2-0.5)
Race/Ethnicity								
Non-Hispanic White	1.0	(1.0-1.0)						
Non-Hispanic Black	1.0	(0.7-1.4)						
Hispanic	0.9	(0.6-1.3)						
Non-Hispanic Other	1.3	(0.7-2.4)						
Education			**Education**					
Less than high school	0.7	(0.5-1.0)	Less than high school	0.6	(0.4-0.9)			
High school graduate	0.6	(0.4-1.)	High school graduate	0.6	(0.4-0.8)			
Some college	1.0	(0.6-1.6)	Some college	1.0	(0.6-1.5)			
College grad or more	1.0	(1.0-1.0)	College grad or more	1.0	(1.0-1.0)			
Marital Status								
Married/Living with Partner	1.0	(1.0-1.0)						
Divorced/Separated/Widowed	0.9	(0.6-1.2)						
Never married	1.0	(0.7-1.6)						
# Non-Arthritis chronic conditions			**# Non-Arthritis chronic conditions**					
0	1.0	(1.0-1.0)	0	1.0	(1.0-1.0)			
1	0.6	(0.4-.09)	1	0.7	(0.5-1.0)			
2	0.5	(0.3-.08)	2	0.6	(0.4-1.0)			
≥3	0.3	(0.2-.05)	≥3	0.3	(0.2-0.6)			

Unadjusted								
Arthritis	**HR**	**95% CI**						
Health insurance			**Health insurance**					
No	2.0	(1.4-2.9)	No	1.7	(1.3-2.5)			
Yes	1.0	(1.0-1.0)	Yes	1.0	(1.0-1.0)			
Serious Psychological Distress								
No	1.0	(1.0-1.0)						
Yes	1.3	(0.8-2.2)						
						Key Functional Limitations		
						No	1.0	(1.0-1.0)
						Yes	0.3	(0.2-0.6)
						Self-Rated Health		
						Excellent/Very good	1.0	(1.0-1.0)
						Good	1.0	(0.7-1.3)
						Fair/Poor	0.4	(0.3-0.6)