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Exploring the Relationship between Age and Tenure With Length of Disability

Elyssa Besen,* Amanda E. Young, and Glenn Pransky

Background *The aging of the workforce, coupled with the changing nature of career tenure has raised questions about the impact of these trends on work disability. This study aimed to determine if age and tenure interact in relating to work disability duration.*
Methods *Relationships were investigated using random effects models with 239,359 work disability claims occurring between 2008 and 2012.*
Results *A 17-day difference in the predicted length of disability was observed from ages 25 to 65. Tenure moderated the relationship between age and length of disability. At younger ages, the length of disability decreased as tenure increased, but at older age, the length of disability increased as tenure increased.*
Discussion *Results indicate that although there is a relationship between length of disability and tenure, age makes a greater unique contribution to explaining variance in length of disability. Future research is needed to better understand why specifically age shows a strong relationship with length of disability and why that relationship varies with age.* Am. J. Ind. Med. 58:974–987, 2015. © 2015 The Authors. *American Journal of Industrial Medicine* Published by Wiley Periodicals, Inc.

KEY WORDS: age; work disability; aging; tenure; length of disability

INTRODUCTION

The United States workforce is aging. In the coming years, there are expected to be fewer workers aged 25–54, and a greater number of workers aged 55 years and over [Toossi 2007]. By 2020, a quarter of the workforce is expected to be age 55 and older [Toossi 2012]. Many of today's older workers have expressed both the desire and the need to continue working past the standard retirement age [Roper and AARP 2002; Mermin et al., 2006]. Traditionally, older age and high tenure were synonymous. Individuals tended to enter the workforce at an organization and remained there until retirement. For many workers, this is no longer the case. Recently, the Bureau of Labor Statistics (BLS) reported that in 2012, close to 15% of people over the age of 55 had been with their employer for 2 years or less [Bureau of Labor Statistics 2012]. Contrasted with figures from 1983 where less than 10% of workers age 55 and older had less than 2 years of tenure, this suggests that age and tenure may not have as strong of a correlation as they once had [Sehgal 1984]. This change has created a situation where some older workers still have very high organizational tenure, but an increasing number of older workers are now among those with the shortest tenure.

The aging of the workforce has raised several questions about the ability of adults to continue working into their later years. One particular area of concern focuses on the impact of the aging workforce on work disability. A highly prevalent cause of work disability is chronic illness. Given that the incidence of chronic illness increases with age [Mitchell 1990; Christ and Diwan 2009; Dall et al., 2013; Shaw et al., 2013], the prevalence of work disability will likely increase as the number of older workers continues to rise. Adding to the concern is research that has consistently shown that the amount of time it takes individuals to return to work (RTW) after an episode of work

Center for Disability Research, Liberty Mutual Research Institute for Safety, Hopkinton, Massachusetts
*Correspondence to: Elyssa Besen, Center for Disability Research, Liberty Mutual Research Institute for Safety, 71 Frankland Road, Hopkinton, MA 01748.
E-mail: Elyssa.besen@libertymutual.com

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disability increases with age [Crook and Moldofsky 1994; MacKenzie et al., 2006; Pransky et al., 2006]. Older workers are also more likely to go back out again after returning to work, and have a higher chance of never achieving a sustained RTW relative to midlife and younger workers [Crook and Moldofsky 1994; Thomas, et al. 1994; Biddle, et al. 2003; Rogers and Wiatrowksi 2005; MacKenzie, et al. 2006; Pransky, et al. 2006; Zuhosky, et al. 2007; Crawford, et al.2010; Berecki-Gisolf, et al. 2012]. There are several possible explanations for why older workers may have worse RTW outcomes than younger workers. Some of these include that older workers may have more serious causes of work disability, recovery may take longer as a result of the biological effects of aging, and older workers may receive fewer accommodations to facilitate returning to work [Berecki-Gisolf et al., 2012; Thomas, et al. 1994].

While research has indicated that work disability outcomes in older workers tend to be worse than younger workers [Turner et al., 2000; Steenstra et al., 2005], research also indicates that higher job tenure is related to a shorter length of disability and better RTW outcomes [Shaw et al., 2001; MacKenzie et al., 2006; Pransky et al., 2006; Lipscomb et al., 2008; Shaw et al., 2009; Morassaei et al., 2013]. Work experience, which is often greater with age, is thought to be a protective factor against age-related declines, and as such it is possible that the increased tenure associated with age may negate the negative findings in regard to age and the length of disability [Avolio et al., 1990; Czaja and Sharit 1998; Schroeder and Salthouse 2004]. While research on this topic is lacking, it is possible that the shorter duration of disability as tenure increases may be largely due to greater organizational attachment, more positive supervisor interactions, and formal and informal accommodations that enable early RTW.

The findings regarding a positive relationship between age and the length of disability and a negative relationship between tenure and the length of disability is somewhat contradictory. If older workers have higher job tenure, and higher job tenure is associated with a shorter length of disability, it could be anticipated that older workers would experience shorter disability durations than younger workers. However, as previously stated, this is not the case. This raises questions as to why this is so.

While the majority of previous research on age and tenure has examined these as independent factors, with little exploration of possible interactions between the two [Pransky et al., 2006], there is some research examining the possible interaction between age and tenure on the length of work disability. One study found that older workers with low tenure had more days off work following an accident than older workers with higher tenure, however for middle-aged workers, the number of days off work was similar across tenure levels [Cellier et al., 1995].

Another study by Thomson and colleagues investigated the interaction and possible nonlinear effects of age and tenure on employee absence, including medically certified sickness absence. An inverted u-shaped relationship between tenure and the number of days of certified sickness absence for both residential care workers and administrators was found. For homecare workers, the positive relationship between age and certified sickness absence was only found at high levels of tenure. In contrast, for residential care workers, the positive relationship was only found at lower levels of tenure [Thomson et al., 2000].

Although the studies noted above provide some useful information on the possible interaction between age and tenure, for a number of reasons the robustness of the findings are questionable. First, the findings are somewhat contradictory. One study suggested more or worse work disability at older ages with higher tenure, whereas the other suggested better outcomes at older ages with higher tenure [Cellier et al., 1995; Thomson et al., 2000]. Second, both of these studies had limited samples in single industries [Cellier et al., 1995; Thomson et al., 2000]. Finally, these studies did not control for important factors such as medical cause of the work disability, the level of physical job demands at work, and industry, which may be significant confounders. There are a few additional studies examining the interaction between age and tenure on work disability claim rates; however these studies did not focus specifically on length of disability [Breslin and Smith 2006; Siow et al., 2011].

The linear relationships between age and the length of disability and between tenure and the length of disability have been well established but research addressing the greater complexity involved in the trivariate relationship among all three variables is sparse. To the extent that older age and shorter tenure are often considered as risk factors for work disability and poor RTW outcomes, and in light of the changing demographics of the working population, coupled with the increasing prevalence of older workers in short-tenure jobs, understanding the complex interplay between age and tenure is important as it has implications for work disability management. The goal of this study is to take a first step in this endeavor. More specifically, the present study utilizes a large database of short-term and long-term disability claims to examine the relationships among age, tenure, and the length of disability. Several research questions are addressed including: (1) are the relationships between age and tenure with the length of disability linear, (2) does the relationship between age and the length of disability change when adjusted for tenure, (3) does the relationship between tenure and the length of disability change when adjusted for age, (4) is the relationship with the length of disability stronger for age than tenure or vice versa, and (5) is there an interaction between age and tenure in predicting the length of disability?

METHODS

This study utilized data from a large, private disability insurance company in the United States. All short-term and

long-term disability claims from January 1, 2008 until December 31, 2012 were assessed for inclusion in this study. Short-term disability and long-term disability are designed to provide wage replacement when individuals need to take time off of work as a result of a non-work-related injury or illness. Claims were followed for 1 year from the initial date of disability or until the claim was closed if that occurred prior to one year. The database for this study includes claims from 1,037 employers ranging in size from 1 to 203,924 individuals, with a median of 591 individuals.

The waiting period for the time between the report of the disability and when wage replacement begins is an average of 7–14 days. In the database from which our data were drawn, over 95% of claims had a waiting period of 14 days or less. To ensure that we were only including claims that involved wage replacement, we restricted our sample to claims with at least 14 days of disability and excluded claims with a waiting period of more than 14 days.

In the current study, we focus on claims for individuals ages 25–65. We excluded claims for individuals age 65 or older as the disability coverage for those individuals is greatly decreased as a function of age. Individuals aged 65 or older commonly use Social Security to cover wage replacement, and thus, the information for the claims of individuals aged 65 or older in our database is not accurate for analytical purposes as the length of disability in the database may not reflect the true length of disability. We also excluded claims for individuals under the age of 25 to avoid including individuals who may not be in their primary careers.

The number of claims included in this study was further restricted based on diagnosis associated with the disability. Claims relating to diagnoses associated with pregnancy (ICD-9 codes 630–677) were excluded from our analyses. To ensure that all claims had a valid medical diagnosis, we also excluded claims with an ICD-9 code relating to supplementary classification of external causes of injury and poisoning (ICD-9 E codes) and claims with an ICD-9 code relating to supplementary classification of factors influencing health status and contact with health services (ICD-9 V codes). Claimants that had multiple claims within one calendar year were excluded from analyses. Finally, we excluded claims with missing values on the key analytic variables.

After these exclusions, 239,359 claims (37% of the initial sample) remained in the analyses. A flow chart of the exclusion process can be found in Figure 1. The claims included in the analyses differed from the excluded claims in the average length of disability (65 days for the included claims and 56 days for the excluded claims), the gender composition (42% male in the included claims and 30% male in the excluded claims), the marital status (50% married in the included claims and 45% married in the excluded claims), the industry groupings (24% in retail trade in the included claims and 16% in the excluded claims), the physical job demands (a higher frequency of medium level of physical demands in the included claims and a higher frequency of low level of physical demands in the excluded claims), the average claimant's age (45 years for the included claims and 42 years for the excluded claims), the average length of tenure (7.6 years for the included claims and 6.6 years for the excluded claims), and the diagnosis (no pregnancy claims in the included claims and 31% pregnancy claims in the excluded claims). The claims did not differ with regards to hours worked per week and income.

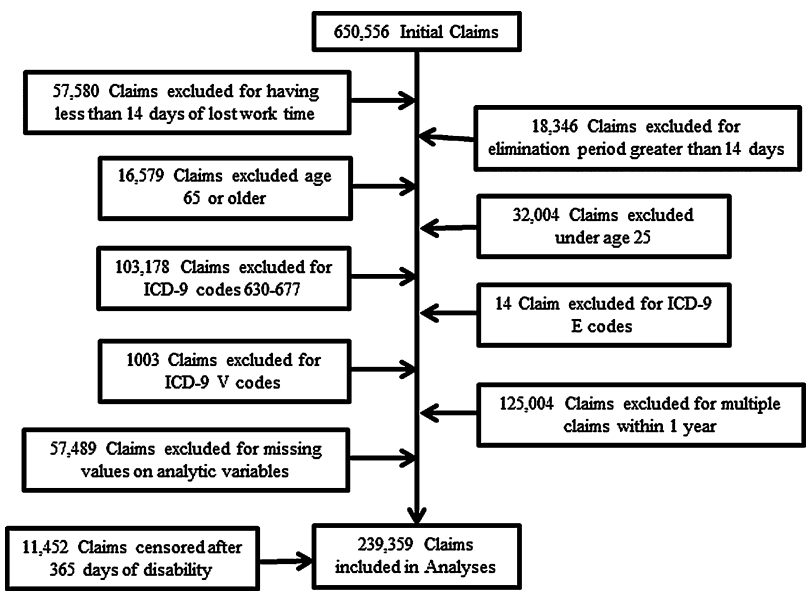

FIGURE 1. Flow Chart of Data Restrictions.

Information about age, tenure, industry, gender, hours worked per week, income, marital status, physical job demands, diagnosis, duration of short-term disability benefits, and length of disability was gathered from the administrative database for each claim. The information for these variables was entered into the database by claims managers based on their conversations with claimants, and gathered from employer personnel data. All data were de-identified for analytic use. This study was approved by the New England Institutional Review Board.

Measures

Predictor variables

The main predictor variables were age and tenure at the date of work disability onset. Tenure was calculated based on the date of hire. Age and tenure were measured in years as continuous variables.

Outcome variable

The outcome variable was length of disability calculated from the start of disability to the end of disability benefits or was censored at 365 days in cases where disability benefits lasted longer than one year. [Note: the end of disability benefits does not necessarily coincide with return to work]. In claims where the claimant never transitioned from short-term disability to long-term disability, the end of disability benefits reflected the end date for short-term disability. In claims where the claimant did transition from short-term disability to long-term disability, the end of disability benefits reflected the end date for long-term disability.

Covariates

The following covariates were used: gender, hours worked per week, annual income, marital status, physical job demands, duration of short-term disability benefits, industry, and diagnosis. Gender was coded 1 for female and 0 for male. Hours worked per week were coded as part-time for working 0–29 hr per week (reference group), full-time for working 30–54 hr per week, and overtime for working 55 hr or more per week. Annual income was coded in groups in $10,000 increments. For example, $0–$9,999 was coded as the first category, $10,000–$19,999 was coded as the second category, $20,000–$29,999 was coded as the third category and so forth up to $149,999. For income of $150,000 or higher, this was coded as a single category of income. Marital status was coded 1 for married and 0 for unmarried. Physical job demands was a categorical variable coded as 1 for sedentary, 2 for light demands, 3 for medium demands, 4 for heavy demands, and 5 for very heavy demands. Physical job demands was assessed by claims managers based on their conversation with claimants about the level of physical job demands in their position. There are differences across employers for when claimants transition from short-term disability to long-term disability benefits. A continuous variable indicating the duration of short-term disability benefits available through the employer's benefit plan was included as a covariate in analyses. This duration varied from 5 days to 1 year. Industry was categorized into eight groups including: construction, finance and insurance, manufacturing, mining, retail trade, services, transportation, and wholesale trade. These industry groupings match up with the U.S. Department of Labor's Standard Industry Classification (SIC) groups with the exception of agriculture, forestry, and fishing, as well as public administration which were not represented in the database [OSHA 2014]. Diagnoses were assessed using the International Classification of Diseases, ninth revised edition (ICD-9). Diagnoses were collapsed into the major chapters of the ICD-9.

Analyses

Random effects models were used to estimate the relationship between age and tenure with length of disability. [Note: To address issues with normality, the natural log of the length of disability was used. This resulted in an adequately normal distribution.] Random effects models, as opposed to ordinary least squared regression models, were selected in order to take into account the non-independence of observations across industry and ICD-9 chapter groupings [Baum 2006]. The non-independence of observations results from the correlation of observations within the industry and ICD-9 chapter groupings which is generally referred to as clustering [Fitzmaurice et al., 2011]. For example, the length of disability may vary systematically across industry groups such that the lengths of disability for individuals within the construction industry are more similar to each other than to individuals within the mining industry. In random effects models, the variability between groups is taken into account by letting the constant, also known as the intercept, vary across groups while keeping the other estimates fixed [Baum 2006]. A crossed-effect approach was used which allowed for a random effect of each industry by ICD-9 chapter pairing. To illustrate, for each of the eight industries, a separate pairing was created for each of the ICD-9 chapters within the respective industry. In cases where the industry by ICD-9 chapter pairing had no claims, this pairing was excluded from the model.

The models were estimated in a series of steps. First, we examined possible non-linearity in the relationships between age and tenure with length of disability. To do this, we first added the linear terms for both age and tenure. We then added the squared terms for age and tenure to the model. Terms reaching statistical significance were included in the final

model. We tested separate models for age and tenure and then combined age and tenure, and their appropriate polynomial terms into a single model. In Model 1, we entered the linear age term and in Model 2, we entered the quadratic age term in addition to the linear term without including tenure in the model. In Model 3, we entered the linear tenure term and in Model 4 we entered the quadratic tenure term in addition to the linear term without including age in the model. In Model 5, we entered the appropriate age and tenure terms into a single combined model. Once we identified the proper age and tenure terms to be included in the model, we added the appropriate interaction terms between age and tenure. Analyses were adjusted for gender, hours worked per week, income, marital status, physical job demands, and duration of short-term disability benefits. All continuous variables in the models were mean-centered to reduce issues with multi-collinearity. The analyses were performed using STATA 13 (Stata Corporation, College Station, Texas). Due to the large sample size, a *P*-value of less than 0.001 was considered statistically significant. In addition, we provide confidence intervals for all estimates.

RESULTS

In total, 239,359 claims were analyzed. The vast majority of claims (97%) were for full-time workers. Slightly more than half of claims (58%) were for women and half (50%) were for married individuals. Close to two thirds (59%) of the claims were for workers with a yearly income of less than $40,000 and just under five percent (4.3%) were for workers with an income of $100,000 or higher. With regards to the physical demands of the claimant's jobs: 31.5% of workers were employed in sedentary jobs, 21.2% were in jobs with light physical demands, 31.6% were in jobs with medium physical demands, and 14.8% were in jobs with heavy physical demands. Only a very small percentage of claims were for workers in jobs with very heavy physical demands (0.9%). Table I presents the number of claims in each of the major chapters. As can be seen in the table, diagnoses in the Disease of the Musculoskeletal System and Connective Tissue chapter (27.6%) were by far the most common in the claims, followed by diagnoses in the Injury and Poisoning chapter (13.4%) and diagnoses in the Mental Disorders chapter (10.1%). The prevalence of the diagnoses within claimants was found to vary by age. Older workers were more likely to have diagnoses in the Disease of the Musculoskeletal System and Connective Tissue or Neoplasms chapters, while younger workers were more likely to have diagnoses in the Mental Disorders or Injury and Poisoning chapters.

Claimant's ages ranged from 25 to 65, with an average age of 45.3 years. Tenure ranged from 0 to 25 years, with the average being 7.6 years. The observed length of disability ranged from 14 days to 365 days, with an average length of disability of 76.3 days. Less than 10% of the sample had a length of disability of more than 365 days and this was largely consistent across age by tenure groupings, although there was a slightly higher percentage of claimants reaching 365 days in the older claimants (7.9% for ages 55–64) relative to the younger claimants (2.2% for ages 25–34). The breakdown of claims by age and tenure is presented in Table II and the correlation between age and tenure was 0.31 ($P < 0.001$).

In the first step of the analyses, we estimated a series of models to test for non-linearity in the relationships between age and tenure with length of disability. The results are presented in Table III. For age, we found that the relationship with length of disability was linear (Models 1 and 2). There was a positive relationship such that as age increased, the length of disability also increased. Going from age 25 to age 65, there was a predicted 17-day difference in the mean length of disability, from 40.1 days at age 25, to 57.4 days at age 65. We also tested how the relationship between age and length of disability changed when adjusted for tenure. To do this we compared the age coefficient in Model 1, where tenure was not included to Model 5, where tenure was included using a Wald Test. We found no difference in the coefficients based on whether or not tenure was included in the model ($\chi^2 = 6.97$, $P = 0.01$).

For tenure, we found a non-linear relationship with length of disability. Specifically, we found both the tenure and tenure squared terms to be significant at $P < 0.001$ (Models 3 and 4). The non-linear tenure relationship is plotted in Figure 2. This figure was plotted based on the predicted values in Model 4 which was not adjusted for age, as well as for the predicted values in Model 5 which adjusted for age. As can be seen in the figure, for both the unadjusted and adjusted lines, the relationship between tenure, and length of disability is non-linear. For the unadjusted relationship, the predicted length of disability increased from 46.6 days of disability at 1 year of tenure to 49.4 days of disability at 20 years of tenure. After 20 years of tenure, the predicted length of disability began to slightly decrease. For the adjusted relationship, the difference in the predicted length of disability was much smaller, varying by only about a day, from 48.2 days at 1 year of tenure to 48.4 days at 5 years of tenure, and declining back to 47.1 days at 20 years of tenure. In addition, the turning point of the relationship in the age adjusted model was around 5 years of tenure as opposed to 20 years of tenure in the unadjusted model. For the unadjusted model, the relationship between tenure and length of disability was mostly positive with the number of days increasing as tenure increases, whereas for the adjusted model, the reverse was true, with the length of disability mostly decreasing as tenure increases. When comparing the size of the tenure coefficients in the adjusted and unadjusted model using a Wald Test, the coefficients were significantly

TABLE I. Number of Claims in each ICD-9 Chapter by Age

ICD-9 Chapter Title	ICD-9 Codes	Number of Claims by Age Group																	
		25–29		30–34		35–39		40–44		45–49		50–54		55–59		60–64		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Infectious and Parasitic Diseases	001–139	449	2.09%	465	1.76%	466	1.54%	548	1.54%	588	1.52%	572	1.57%	488	1.64%	323	1.58%	3899	1.63%
Neoplasms	140–239	754	3.52%	1121	4.24%	1659	5.49%	2501	7.01%	3046	7.86%	3065	8.39%	2732	9.17%	2090	10.20%	16968	7.09%
Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders	240–279	585	2.73%	900	3.41%	984	3.25%	1066	2.99%	984	2.54%	797	2.18%	554	1.86%	317	1.55%	6187	2.58%
Diseases of the Blood and Blood-Forming Organs	280–289	64	0.30%	76	0.29%	84	0.28%	82	0.23%	94	0.24%	72	0.20%	49	0.16%	38	0.19%	559	0.23%
Mental Disorders	290–319	3690	17.21%	4322	16.37%	4021	13.29%	3659	10.26%	3338	8.61%	2639	7.22%	1646	5.53%	800	3.90%	24115	10.07%
Diseases of the Nervous System	320–359	937	4.37%	1158	4.38%	1406	4.65%	1631	4.57%	1831	4.72%	1835	5.02%	1583	5.31%	1045	5.10%	11426	4.77%
Diseases of the Circulatory System	390–459	425	1.98%	821	3.11%	1083	3.58%	1643	4.61%	2372	6.12%	2886	7.90%	2924	9.82%	2416	11.79%	14570	6.09%
Disease of the Respiratory System	460–519	1083	5.05%	1136	4.30%	1100	3.64%	1103	3.09%	1102	2.84%	1184	3.24%	1064	3.57%	750	3.66%	8522	3.56%
Diseases of the Digestive System	520–579	2373	11.07%	2862	10.84%	3093	10.23%	3476	9.74%	3766	9.72%	3626	9.92%	2796	9.39%	1789	8.73%	23781	9.94%
Diseases of the Genitourinary System	580–629	1096	5.11%	2164	8.19%	3630	12.00%	5116	14.34%	4604	11.88%	2648	7.25%	1484	4.98%	1070	5.22%	21812	9.11%
Diseases of the Skin and Subcutaneous Tissue	680–709	340	1.59%	313	1.19%	336	1.11%	306	0.86%	378	0.98%	348	0.95%	276	0.93%	164	0.80%	2461	1.03%
Disease of the Musculoskeletal System and Connective Tissue	710–739	4573	21.33%	5989	22.68%	7233	23.91%	9051	25.37%	10883	28.08%	11492	31.45%	9846	33.05%	6942	33.88%	66009	27.58%
Congenital Anomalies	740–759	84	0.39%	88	0.33%	95	0.31%	108	0.30%	95	0.25%	105	0.29%	90	0.30%	66	0.32%	731	0.31%
Certain Conditions Originating in the Perinatal Period	760–779	40	0.19%	54	0.20%	33	0.11%	11	0.03%	6	0.02%	8	0.02%	9	0.03%	3	0.01%	164	0.07%
Symptoms, Signs, and Ill-Defined Conditions	780–799	660	3.08%	742	2.81%	847	2.80%	907	2.54%	927	2.39%	786	2.15%	646	2.17%	468	2.28%	5983	2.50%
Injury and Poisoning	800–999	4291	20.01%	4199	15.90%	4176	13.81%	4470	12.53%	4749	12.25%	4476	12.25%	3602	12.09%	2209	10.78%	32172	13.44%

Note: Percentages represent percentage of claims within each respective age group.

TABLE II. Distribution of Claims by Age and Tenure

Age	Tenure												Total	
	Less than 1 yr		1 yr up to 2 yrs		2 yrs up to 5 yrs		5 yrs up to 10 yrs		10 yrs up to 20 yrs		20 yrs or more			
Groups	# of Claims	% of Claims	# of Claims	% of Claims	# of Claims	% of Claims	# of Claims	% of Claims	# of Claims	% of Claims	# of Claims	% of Claims	# of Claims	% of Claims
25–29	3661	1.53%	4391	1.83%	8803	3.68%	4387	1.83%	202	0.08%	0	0.00%	21444	8.96%
30–34	3173	1.33%	4185	1.75%	8501	3.55%	7597	3.17%	2954	1.23%	0	0.00%	26410	11.03%
35–39	2979	1.24%	3829	1.60%	8255	3.45%	8091	3.38%	6957	2.91%	135	0.06%	30246	12.64%
40–44	2963	1.24%	3779	1.58%	8582	3.59%	8720	3.64%	9465	3.95%	2169	0.91%	35678	14.91%
45–49	2756	1.15%	3613	1.51%	8724	3.64%	9434	3.94%	10280	4.29%	3956	1.65%	38763	16.19%
50–54	2234	0.93%	3147	1.31%	8085	3.38%	9277	3.88%	10134	4.23%	3662	1.53%	36539	15.27%
55–59	1510	0.63%	2317	0.97%	6211	2.59%	7924	3.31%	8766	3.66%	3061	1.28%	29789	12.45%
60–64	681	0.28%	1209	0.51%	4084	1.71%	5834	2.44%	6666	2.78%	2016	0.84%	20490	8.56%
Total	19957	8.34%	26470	11.06%	61245	25.59%	61264	25.60%	55424	23.16%	14999	6.27%	239359	100.00%

stronger for the unadjusted model ($\chi^2 = 106.61$, $P < 0.001$). Furthermore, a Wald Test also revealed that the strength of the relationship with length of disability was stronger for age than for tenure ($\chi^2 = 532.61$, $P < 0.001$). [Note: when comparing the coefficients, age and tenure were both measured in years].

Results from the second step of the analyses, which examined the interaction between age and tenure with length of disability, indicated a significant interaction (see Table IV). To further explore the interaction, following Aiken and West's procedure [Aiken and West 1991], we plotted the relationship between age and length of disability for workers with different lengths of tenure in order to assess how the relationship varies based on tenure (see Fig. 3).

Interpretation of the figure suggested that the strength of the positive relationship between age and length of disability increased as tenure increased. At younger ages, as tenure increased, the predicted length of disability decreased, while at older ages, the predicted length of disability increased as tenure increased. Specifically, at age 30, the predicted length of disability varied from 42.3 days at 1 year of tenure to 41.5 days at 10 years of tenure. In contrast, at age 65, the predicted length of disability varied from 56.7 days at one year of tenure, to 58.5 days at 15 years of tenure. Interestingly, between ages 50 and 55, the predicted length of disability showed nearly no differences for the different lengths of tenure, varying by less than half a day. Overall, the greatest predicted length of disability was for the oldest workers in our sample with the highest tenure, while the shortest predicted length of disability was for the youngest workers in our sample with the highest tenure.

Across the models, several of the covariates included in the analyses revealed significant relationships with the length of disability. For working hours, working less than 30 hr per week was associated with a greater length of disability than working 30–54 hr per week. There was a negative relationship between income and the length of disability such that the length of disability decreased as income increased. Being married was associated with a shorter length of disability than being non-married. The level of physical job demands was related to the length of disability such that as physical job demands increased, the length of disability also increased. Finally, as the duration of short-term disability benefits available through the employer's benefit plan increased, the length of disability also increased.

Beyond our primary analyses, additional analyses were conducted to assess how the relationships between age, tenure, and the length of disability may vary by gender. To do this, interaction terms between age and gender, tenure, and gender, and age, tenure and gender, were included in analyses. The results of these sub-analyses did not reveal any significant variation in our reported results based on gender. The results from these sub-analyses are available upon request.

TABLE III. Random Effects Model for Linearity Testing of Age and Tenure Predicting Length of Disability

	Model 1: Age Linear		Model 2: Age Quadratic		Model 3: Tenure Linear		Model 4: Tenure Quadratic		Model 5: Combined Model	
Predictors	**Coef(S.E.)**	**95% CI**	**Coef(S.E.)**	**95% CI**	**Coef(S.E.)**	**95% CI**	**Coef(S.E.)**	**95% CI**	**Coef(S.E.)**	**95% CI**
Age[a]	0.090(0.002)*	0.086:0.093	0.090(0.002)*	0.087:0.093					0.092(0.002)*	0.088:0.095
Age^2			0.003(.002)	0.000:0.006						
Tenure[b]					0.016(.001)*	0.013:0.018	0.022(.002)*	0.018:0.025	−0.003(0.002)	−0.006:0.001
Tenure^2							−0.005(.001)*	−0.007:-0.003	−0.003(.001)*	−0.005:-0.001
Female[c]	−0.003(0.004)	−0.011:0.004	−0.003(0.004)	−0.010:0.004	0.003(0.004)	−0.004:0.010	0.002(0.004)	−0.005:0.009	−0.003(0.004)	−0.010:0.005
Full-Time[d]	−0.077(.013)*	−0.102:-0.051	−0.076(0.013)*	−0.101:-0.051	−0.081(0.013)*	−0.106:-0.055	−0.081(0.013)*	−0.106:-0.056	−0.077(0.013)*	−0.102:-0.051
Overtime[d]	−0.060(0.019)	−0.098:-0.022	−0.060(0.019)	−0.098:-0.022	−0.057(0.019)	−0.095:-0.018	−0.056(0.019)	−0.094:-0.018	−0.061(.019)	−0.099:-0.023
Income	−0.009(.001)*	−0.010:-0.008	−0.009(0.001)*	−0.010:-0.008	−0.007(0.001)*	−0.008:-0.005	−0.007(0.001)*	−0.008:-0.005	−0.009(0.001)*	−0.010:-0.007
Married[e]	−0.013(.003)*	−0.020:-0.007	−0.013(0.003)*	−0.019:-0.006	0.005(0.003)	−0.001:0.012	0.005(0.003)	−0.002:0.011	−0.013(0.003)*	−0.019:-0.006
Physical Demands	0.046(0.002)*	0.043:0.050	0.046(0.002)*	0.043:0.050	0.046(0.002)*	0.042:0.049	0.045(0.002)*	0.042:0.049	0.047(0.002)*	0.043:0.050
STD Max Days	0.001(0.000)*	0.001:0.001	0.001(0.000)*	0.001:0.001	0.001(.000)*	0.001:0.001	0.001(0.000)*	0.001:0.001	0.001(0.000)*	0.001:0.001
Intercept[f]	3.957(0.027)*	3.903:4.011	3.952(0.027)*	3.899:4.006	3.945(0.028)*	3.891:4.000	3.954(0.027)*	3.900:4.008	3.961(0.027)*	3.909:4.014

*P-value <0.001

[a]Age coded in 10s of years (e.g., one unit of age is 10 years).

[b]Tenure coded in 5s of years (e.g., one unit of tenure is 5 years).

[c]Male is the reference group.

[d]Part-time is the reference group.

[e]Unmarried is the reference group.

[f]Natural log of length of disability.

Random effects for industry by ICD-9 chapter pairings used.

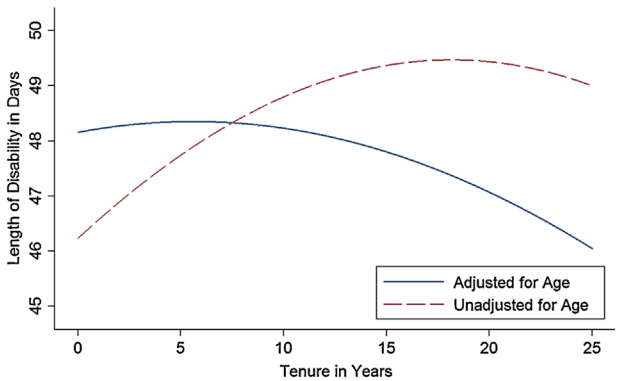

FIGURE 2. Plot of the Relationship between Tenure and Length of Disability. *Note*: This figure is based on predicted values at the given lengths of tenure.

DISCUSSION

The aging of the workforce, coupled with the changing nature of career progression has resulted in some older workers having relatively short lengths of tenure [Sehgal 1984; Toossi 2007; Bureau of Labor Statistics 2012; Toossi 2012]. This has raised questions about the impact of these trends on work disability outcomes. In the current study, we examined the relationship of age and tenure with length of disability and considered possible interactive effects between age and tenure on this relationship using a large database of short-term and long-term disability claims.

TABLE IV. Random Effects Model for Age and Tenure Interaction Predicting Length of Disability

Predictors	Coef(S.E.)	95% CI
Age[a]	0.093(0.002)*	0.088:0.097
Tenur[b]	−0.003(0.002)	−0.007:0.000
Tenure^2	−0.005(0.001)*	−0.008:−0.003
Age × Tenure	0.008(0.002)*	0.004:0.011
Age × Tenure^2	0.001(0.001)	−0.001:0.003
Female[c]	−0.002(0.004)	−0.010:0.005
Full-Time[d]	−0.077(0.013)*	−0.102:−0.051
Overtime[d]	−0.061(0.019)	−0.099:−0.023
Income	−0.009(0.001)*	−0.010:−0.007
Married[e]	−0.012(0.003)*	−0.019:−0.006
Physical Demands	0.047(0.002)*	0.043:0.050
STD Max Days	0.001(0.000)*	0.001:0.001
Intercept[f]	3.960(0.027)*	3.908:4.013

*P-value <0.001
[a]Age coded in 10s of years (e.g. one unit of age is 10 years).
[b]Tenure coded in 5s of years (e.g. one unit of tenure is 5 years).
[c]Male is the reference group.
[d]Part-time is the reference group.
[e]Unmarried is the reference group.
[f]Natural log of length of disability.
Random effects for industry by ICD-9 chapter pairings used.

As expected, we found a positive linear relationship for age with length of disability, which is consistent with previous research [Pransky et al., 2006]. There was roughly a two and a half week difference in the length of disability for workers age 25 compared to workers age 65. The increase in the length of disability with age may be reflective of several factors including poorer health at older ages, increased recovery time with age as a result of the physiological changes that occur with aging, and a lack of services to help facilitate RTW [Thomas et al., 1994; Christ and Diwan 2009; Berecki-Gisolf et al., 2012; Dall et al., 2013]. The age-length of disability relationship found in this study persisted despite the well-known healthy worker effect where older adults who are still involved in employment at older ages are thought to be among the healthiest in that age group since they are still able to be involved in employment [Li and Sung 1999]. It is possible that in the current study, the age relationship found was actually underestimated since our sample primarily focused on older adults employed full-time.

Findings indicated age differences in the diagnoses associated with disability. Older workers were more likely to have cancers or musculoskeletal disorders as the cause of disability, whereas younger workers were more likely to have injury/poisonings or mental disorders as the cause of disability. Based on previous work suggesting that the poor RTW outcomes in older workers are the result of differences in the causes of work disability [Berecki-Gisolf et al., 2012], it is possible that the findings observed in this paper are reflective of older workers having different diagnoses relating to disability and those different diagnoses resulting in greater recovery time and lengths of disability. Although our analyses accounted for differences in the average length of disability by diagnosis chapter, we did not focus specifically on stratified analyses for certain key diagnoses. Future research may seek to assess differences in the relationship between age and the length of disability by diagnosis.

For tenure, we found a non-linear relationship such that initially as tenure increased, the predicted length of disability also increased but at approximately 5 years of tenure, the relationship reversed with the length of disability decreasing as tenure increased. The actual difference in the predicted lengths of disability across different tenure durations was relatively small, varying by only about a day. In addition, we found that the relative strength of the relationship with length of disability was much greater for age than for tenure. For age, the relationship with length of disability changed very little when adjusted for tenure. However, the relationship between tenure and length of disability was strongly influenced by age. Although both the age and tenure relationships remained statistically significant in the final model, it is clear from the findings that age seems to be a more important factor in the length of disability than tenure. It is possible that as the standard career trajectory changes

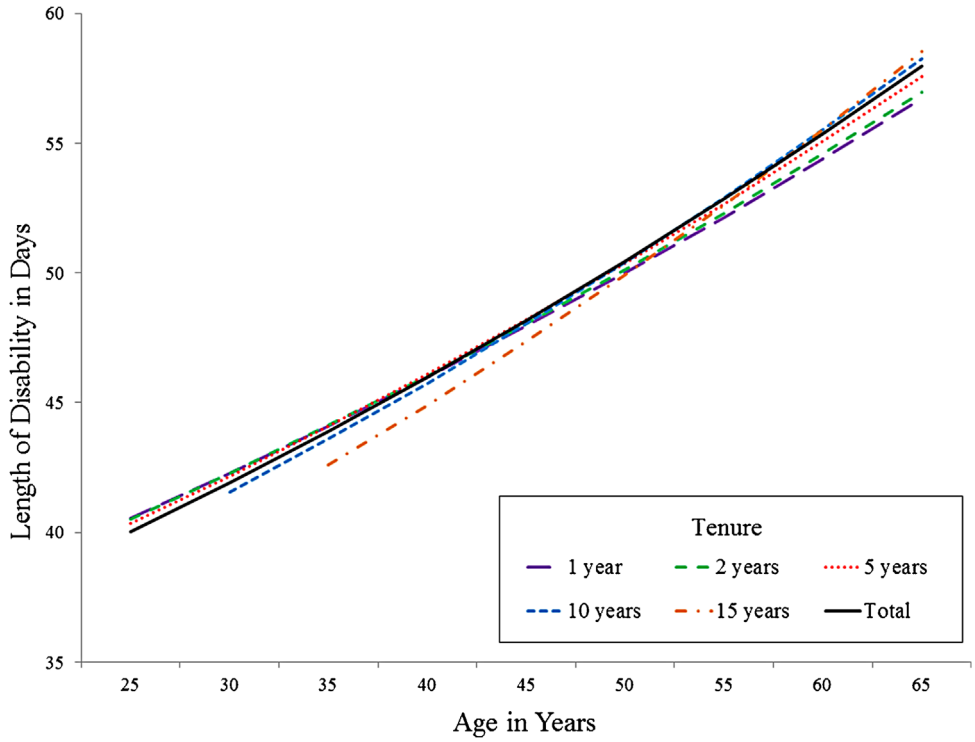

FIGURE 3. Plot of the Interaction between Age and Tenure Predicting Length of Disability. *Note*: This figure is based on predicted values at the given age and tenure intersections.

and there are an increased number of workers switching jobs frequently across the lifespan, resulting in shorter lengths of tenure, that some of the advantages as they relate to the length of disability with increased tenure may be disappearing.

The majority of previous research on tenure and length of disability has found a negative relationship; that is, as tenure increases, disability duration decreases, which may be reflective of greater job satisfaction as tenure increases, greater organizational attachment, and better relationships with supervisors [Shaw et al., 2005; MacKenzie et al., 2006 Pransky et al., 2006 Shaw et al., 2009]. When examining just the linear relationship between tenure and length of disability, our findings were similar to previous research. The current study extends the previous literature though by suggesting a non-linear relationship, where up to five years of tenure, there is actually a slight increase in length of disability as tenure increases. There are a few possibilities that may explain this finding. Much of the prior research focused on RTW after a work-related injury in workers' compensation data. It is possible that our finding indicating an initial increase in length of disability for longer tenure could be reflective of our use of group disability data which contains a larger number of claims for chronic illness. Another possibility is that if previous research had tested and adjusted for possible non-linearity, the observed relationships may have been more similar to ours. In the one study that did assess possible non-linear relationships using certified sickness absence data, the authors had similar findings to the current study with a slightly inverted u-shaped relationship observed [Thomson et al., 2000].

A main focus of our study was the interaction between age and tenure. We found that tenure moderated the relationship between age and length of disability, with the positive relationship being stronger as tenure increased. At younger ages, the length of disability decreased as tenure increased, but at older ages, the length of disability was greater for older workers with higher tenure compared to older workers with lower tenure. This finding is in line with some previous research. For example, one study found that for homecare workers, age was only related to the length of certified sickness absence at high levels of tenure. Though, that same study found that for residential care workers, the reverse was true where age was more strongly related to the length of certified sickness absence at lower levels of tenure [Thomson et al., 2000]. Similarly, in another study, the number of days off following an accident was found to be lower for older workers with higher tenure compared to older workers with lower tenure [Cellier et al., 1995]. However, it should be noted that this study was focusing on lost work time as a result of a work-related incident, which may

account for the difference in findings, as the current study was focused on non-work related causes of disability. In the current study, many of the causes of disability were chronic in nature which involves ongoing management of the health condition, as opposed to acute injury where an individual may fully recover. As such, the return to work process may differ as individuals returning to work after chronic illness may never be symptom free.

Implications

There are several implications based on our findings. First, our results suggest that age has a stronger relationship with length of disability than tenure. However, results also indicated the relationship between age and length of disability varies depending on the workers' length of tenure. Previous research has generally focused on these factors independently instead of examining them together. Our results highlight the importance of assessing these factors in combination. In addition, it is has been suggested that the relationship between age and outcomes, such as job satisfaction, is influenced by the strong relationship between age and tenure, with the age relationship reflecting the underlying tenure component [White and Spector 1987; Kacmar and Ferris 1989; Bedeian et al., 1992]. We did not find support for a large change in the relationship between age and length of disability when adjusting for tenure, but we did observe a weakened relationship between tenure and length of disability when we adjusted for age. Despite the adjustment, the relationship between tenure and length of disability remained small but significant. Taken together, our results suggest that although there may be a small amount of variance in the length of disability accounted for by tenure, age makes a greater unique contribution in explaining the variance in length of disability.

A second implication of our findings relates to the observed interaction between age and tenure. Our results indicate that those with the longest disability durations are older workers with higher tenure. In comparison to younger workers with higher tenure, who had the shortest length of disability, older workers with the longest tenure were predicted to have a length of disability that was more than two weeks longer. From an intervention perspective, older workers with high tenure may be a group to target as they may have unique challenges relating to returning to work. For certain older workers with high tenure, they may be more likely to stay in their jobs longer, as they may have a greater burden of chronic illness and a desire to protect their access to relatively generous health and disability benefits. In some studies, these workers have been referred to as "job-locked" [Benjamin et al., 2008 Wilkie et al., 2011]. On the other hand, it is also possible that older workers with high tenure are not actually in need of intervention, in that these workers, who have been with their organizations the longest and are most secure in their jobs, may have a better grasp of the time they need to take off, and thus remain on disability for the appropriate period of time. In this case, older workers with lower tenure may feel less job security and therefore rush back to work before being ready for fear of losing their jobs. Future research is needed to determine if older individuals who take longer to RTW ultimately have a more sustained RTW outcome.

Another implication has to do with employers' fears about recruiting older workers. Some employers may be reluctant to hire older workers for fears about their taking extended periods of time off due to illness. Our findings indicate that older workers with shorter lengths of tenure (recent hires) are not actually the group at highest risk for having longer disability durations. Rather, this group had sickness durations that were on average shorter than older workers with longer tenure. In our study, and consistent with other age groupings, less than 10% of older workers were found to still be on disability benefits after a year of taking short-term or long-term disability. As such, our findings suggest that employers should not avoid hiring older workers because they are concerned about them taking time away from the workplace that is any greater than their similarly aged current employees, or not returning to the workforce after an episode of work disability.

Moving beyond the findings of the current study, future research on the topic of age, tenure, and the length of disability should seek to understand why there is a strong relationship between age and the length of disability and why specifically this relationship varies with tenure. The current study was largely administratively based and while we suggest reasons for our findings, research has not yet addressed if our suggestions are indeed correct. Age and tenure are not factors that can be changed, so knowing that older workers or low tenure workers have greater lengths of disability provides limited opportunity for improving RTW outcomes. The current study was a necessary first step in documenting the nature of the age, tenure, and length of disability relationship. In order identify possible modifiable factors within the RTW process that age and tenure may be a proxy for, it is now important to explore the reasons for these findings, such as by assessing differences by age and tenure in recovery, the availability of RTW resources, and the quality of relationships with supervisors.

Limitations

Strengths of our study include the use of a large, national database of short-term and long-term disability claims representing a broad range of industries, income levels, ages, and tenures. However, our study is not without its limitations. This study relies on existing data not directly

collected with the aim of examining the relationship between age and tenure with length of disability and as a result, there are many variables of interest that were not available for use in our analyses (e.g., individual's attachment to their jobs, relationships at work, or availability of accommodations). While our results pointed to an interaction between age and tenure, we are unable to examine factors that may help us to further understand the cause of this interaction. Future research may seek to better explain the underlying mechanisms for why the relationship between age and length of disability varies with tenure and what implications this has for practice.

As with many studies using administrative data, our definition of length of disability focuses on the time until the end of disability benefits as opposed to the time until returning to work. For many claims, the end of disability benefits coincides with return to work, but there may be claims where this is not the case. This could result in claims with a relatively short length of disability where these claimants were actually out of work longer or possibility permanently. Unfortunately, in the administrative data from this study, there is no information about whether a claimant truly returned to work when he or she stopped receiving disability benefits.

There were also limitations associated with using administrative data that relate to the covariates used in analyses. Our measure of physical job demands was entered in the database by the claims manager based on their conversations with claimants. This was not a question that was asked to claimants in a standardized way; rather the claims manager selected the category he/she thought was the most appropriate. It is therefore possible that this variable does not truly capture claimants' level of physical job demands. The measure of marital status was also limited to just two categories, married, and unmarried, while several other marital situations may exist. This variable was largely non-significant in analyses and this may have resulted from the limited conceptualization of marital status. While our analyses were adjusted for industry grouping, we were unable to adjust for occupational group which is likely to have an impact on the length of disability. Occupational titles were not entered in a standardized way to the claims database and were not reliable for analytic purposes. Finally, the measure of work hours was highly biased towards the full-time category, with less than three percent of the sample falling in the non-full-time category. The work hours information was entered into the claims database by the claims manager. As opposed to representing actual hours worked per week, the number entered likely reflects the number of contracted work hours per week. For example, one worker contracted for 40 hrs a week may routinely work 45 hrs per week, while another worker contracted for 40 hrs may work 35 hrs per week, but both would have the same number of contracted work hours entered into the claims database. Based on the way the information is entered into the database, we were unable to measure work hours as a continuous variable representing true work hours which limited the utility of this covariate.

Another limitation relates to the nature of short-term and long-term disability. In the United States, short-term disability is often covered by the employer but long-term disability benefits are typically voluntary programs that employees choose to participate in. While the majority of claims in our data did not reach the threshold for transitioning to long-term disability, it is possible that in some claims, the end of disability was actually reflective of reaching the maximum duration for short-term disability without having long-term disability coverage to transition into. As a result at the longest durations of disability, our sample may be biased to those individuals who opted to have long-term disability benefits. Additionally, older workers with higher tenure who are more secure in their jobs may be more likely to opt for long-term disability benefits, possibly resulting in greater durations of disability.

Short-term and long-term disability programs are also not universal across employers. Our data included claims from over 1,000 companies and we were unable to control for differences in the disability benefits across claims. It is likely that there is variation in the length of disability to be explained by employer and company differences; however, in the current study, we are unable to examine these factors as we lacked employer level data. Furthermore, our data focused almost exclusively on claims for full-time workers, as many part-time workers do not receive these types of disability benefits. As such, our results are only applicable to individuals employed full-time with access to short-term and long-term disability benefits.

In the current study, there were several key differences between the claims that were included and those that were excluded. Approximately 25% of the excluded claims were for time off relating to pregnancy. Most employers have set limits on short-term disability associated with pregnancy such as 6 weeks leave or 8 weeks leave, and the age range for having children is often much more restricted than ages 25–65. As a result, the length of disability is often within a standard range for pregnancy and shows far less variability by age than for other diagnoses. An additional 30% of the excluded claims related to claimants with multiple claims within the same calendar year. We believe that these claimants may represent a non-standard group of individuals with severe health concerns resulting in recurrent disability. While we excluded these cases in the current study, this group could prove an interesting subpopulation for future research.

This study focused on claims for both younger and older workers. It is therefore possible that there may be a healthy worker effect in our sample, meaning that the older workers in our sample are among the healthiest since they are still able to remain employed at older ages, while the unhealthiest

younger workers may still be involved in paid employment [Li and Sung 1999]. If this is the case, some of our relationships may have been underestimated at older ages as the unhealthiest of workers are likely to have already left the workforce and accordingly, they would not have disability claims initiated at older ages. In addition, the diagnoses associated with disability in this study showed some variation across age groups. For example, a greater proportion of claims for older workers were for Disease of the Musculoskeletal System and Connective Tissue while a greater proportion of claims for younger workers were for Mental Disorders. While our analyses involved random effects models that took into account diagnosis, it is possible that our results may still have been biased by age differences in diagnoses. We also were unable to look at the prevalence of claims for workers of different ages as we lacked information on the total number of potential claimants within organizations. Workers ages 25–29 and workers ages 60–64 had the fewest number of claims represented in our analytic sample, but we are unable to assess whether these groups actually had a greater overall prevalence of experiencing short-term or long-term disability relative to other age groups. Future research is necessary to assess disability benefits utilization across the lifespan, as well as possible differences in the age, tenure, and length of disability relationships across diagnosis groups.

Finally, our study focused on non-work-related causes of work disability and as we alluded to earlier, the relationship with length of disability may vary based on the cause of the work disability. While it is possible that some claimants used short-term or long-term disability benefits for work-related injuries, there are processes in place at the insurance company from which the administrative data were drawn to prevent this from happening. As such, it is likely that there were very few, if any, work-related injuries included in the sample.

CONCLUSIONS

The current findings are consistent with earlier research findings that the amount of time it takes to RTW generally increases with age. Our unique contribution comes from the demonstrated interaction between age and tenure with length of disability, such that older workers with longer tenure appear to take longer to RTW than their similarly aged shorter tenure counterparts. Findings suggest that employers should not be concerned that older-aged new hires will have disability durations that are longer than their current similarly aged employees. As the workforce continues to age and a greater proportion of the workforce is comprised of older workers, it is important to understand older workers experience of the work disability process and the factors that influence it. While the current findings suggest that older workers with shorter tenure take less time to return to work than their longer tenure peers, we are left with questions regarding how this impacts broader health and productivity outcomes. Further research is needed to advance our understanding of the underlying influences and the impact of the interaction on longer-term health and work-disability outcomes.

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