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Pre-existing diabetes and osteoarthritis accounted for 15–23% of differences in wage replacement (sickness absence) among claimants 45 years and older compared to claimants 15–24 years of age, following a work-related musculoskeletal injury. A better understanding of the mechanisms linking diabetes and osteoarthritis to longer durations of sickness absence is required.

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Key terms: age difference; ageing; chronic disease; diabetes; musculoskeletal disease; musculoskeletal work injury; occupational injury; osteoarthritis; path analysis; pre-existing chronic condition; sickness absence; wage replacement

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Original article

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Impact of pre-existing chronic conditions on age differences in sickness absence after a musculoskeletal work injury: A path analysis approach

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Objectives This study aims to examine the extent to which a greater prevalence of pre-existing chronic conditions among older workers explains why older age is associated with longer duration of sickness absence (SA) following a musculoskeletal work-related injury in British Columbia.

Methods A secondary analysis of workers' compensation claims in British Columbia over three time periods (1997–1998; 2001–2002, and 2005–2006), the study comprised 102 997 and 53 882 claims among men and women, respectively. Path models examined the relationships between age and days of absence and the relative contribution of eight different pre-existing chronic conditions (osteoarthritis, rheumatoid arthritis, hypertension, coronary heart disease, diabetes, thyroid conditions, hearing problems, and depression) to this relationship. Models were adjusted for individual, injury, occupational, and industrial covariates.

Results The relationship between age and length of SA was stronger for men than women. A statistically significant indirect effect was present between older age, diabetes, and longer days of SA among both men and women. Indirect effects between age and days of SA were also present through osteoarthritis, among men but not women, and coronary heart disease, among women but not men. Depression was associated with longer duration of SA but was most prevalent among middle-aged claimants. Approximately 70–78% of the effect of age on days of SA remained unexplained after accounting for pre-existing conditions.

Conclusions Pre-existing chronic conditions, specifically diabetes, osteoarthritis and coronary heart disease, represent important factors that explain why older age is associated with more days of SA following a musculoskeletal injury. Given the increasing prevalence of chronic conditions among labor market participants (and subsequently injured workers) moderate reductions in age differences in SA could be gained by better understanding the mechanisms linking these conditions to longer durations of SA.

Key terms ageing; chronic disease; diabetes; musculoskeletal disease; occupational injury; osteoarthritis; sickness absence.

Epidemiological research on the consequences of work injury generally suggests that older age is associated with greater time away from work following a work-related injury (1–3). Although older workers have a lower injury rate that younger workers in general (4, 5), the ageing of the labor market in most developed countries has led to a substantial increase in the number of injuries and subsequent claims for wage replacement from older workers (6). Given the average age of labor market participant is predicted to continue to rise until 2021 (7), there is substantial interest among policy-makers and other occupational health and safety stakeholder groups for research

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focused on better understanding of the factors that lead to increased time away from work among older workers compared to their younger counterparts (8–10).

Longer absences among older compared to younger workers may be due to a myriad of factors which include: (i) older workers suffering more severe work injuries; (ii) older workers having lower health status, functional capacity or a greater prevalence of pre-existing comorbid conditions prior to injury, leading to a slower recovery or older workers being required to be at a higher level of functional capacity to return to work; and/or (iii) general perceptions that older workers may be less capable of returning to work as quickly as younger workers, which may influence healthcare provider–worker and workplace–worker interactions in the return-to-work process. These perceptions may also influence self-efficacy that return to work is possible from the perspective of the worker (11–13). It should be noted that these are not competing pathways, but they may interact with each other (eg, comorbidities may lead to more severe injuries and differences in perceptions of a worker's ability to return to work).

Focusing on the impact that having a higher number of pre-existing chronic conditions has on age-related differences in absence from work, the research findings are mixed. A recent systematic review concluded there is strong evidence that chronic conditions were not associated with worse work participation outcomes following a musculoskeletal disorder (MSD) although they were associated with worse pain outcomes (14). However, most studies use general measures of "any comorbidity" that may hide potentially different impacts of specific conditions. A recent New Zealand study reported that while some conditions (such as mental health and osteoarthritis) were associated with greater time off work after any type of injury (both work and non-work), other conditions (such as asthma and stroke) were not (15). As such, much is still to be learnt about the impact of pre-existing chronic conditions on time away from work after a work injury.

The objective of this paper is to examine the relationship between age and MSD work injury in British Columbia. We hypothesize that older age will be associated with more pre-existing chronic conditions, and these conditions will mediate the relationship between age and length of sickness absence (SA) following an injury (ie, these conditions will be associated with more days of wage replacement). However, we expect that the relationship between pre-existing conditions and days of SA will differ across conditions, with the greatest effects observed for workers with osteoarthritis and mental health conditions (15).

Methods

This study used short-term disability claims reported to WorkSafe British Columbia (WorkSafeBC) linked with the British Columbia Discharge Abstract Database (DAD) and Medical Services Plan (MSP) at the individual level. WorkSafeBC is the monopoly provider of workers' compensation in British Columbia and covers approximately 93–94% of the labor force (16). Those excluded from coverage with WorkSafeBC include self-employed workers without employees and minor segments of the employed labor force (eg, athletes, domestic workers employed for <8 hours per week). In the Canadian province of British Columbia, wage replacement is provided from the first full day of work absence, not including the day of the injury. Each claim reported to WorkSafeBC captures the date of incident, the gender and age of the claimant, and the industry and occupation of employment at the time of injury.

For the purposes of this project, we focused only on work-related MSD injury claims with injury dates in 1997–1998, 2001–2002, and 2005–2006. MSD injuries were selected as they represent the greatest proportion of wage-loss claims submitted to WorkSafeBC (6) and are associated with above average wage replacement costs. The method used to identify MSD claims is described in Appendix A (http://www.sjweh.fi/data_repository.php). The most common type of MSD claim identified using the study algorithm was "overexertion event" (ie, sprains, strains and tears due to lifting, pushing, pulling or other movement direct at an outside source), which accounted for more than 50% of MSD injuries among both men and women. Sprain, strains and tears due to body movements that were not directed at an outside source (body reactions) accounted for 17% and 15% of MSD injuries among men and women, respectively; and MSD injuries as the result of repetitive motions accounted for 11% and 7% of injuries among women and men, respectively. Examining the relationship between age, chronic conditions, and SA over three time periods was done to avoid the potential of cohort effects or other time-dependent characteristics, influencing our study findings.

Outcome

The WorkSafeBC database captures all days of wage replacement paid for each claim. Using days of wage replacement, we estimated the length of SA for each respondent over the two-year period following injury.

Independent variable

The age of each claimant at the time of injury was assigned to one of the following five groups: 15–24, 25–34, 35–44, 45–54, and ≥55 years.

Mediating variables

We focused on seven pre-existing treated chronic conditions associated with aging: osteoarthritis, rheumatoid arthritis, hypertension, coronary heart disease, diabetes, thyroid conditions, and hearing problems. In addition, we included pre-existing episodes of unipolar depression given it has been associated with worse return-to-work outcomes (17, 18). Conditions were identified using the MSP and DAD databases. The MSP database includes records of outpatient medical services (general practitioner, specialist, and other health professional visits) provided to all Canadian citizens or permanent residents who live in British Columbia for at least six months in a calendar year with a few minor exceptions. The DAD contains information on discharges, transfers, and deaths of in-patients and day-surgery patients from acute care hospitals in British Columbia. We used five years of data before each injury to determine the presence of pre-existing conditions. Claimants with either one hospital (DAD) or two medical (MSP) records within a two-year period were classified as having the condition. A list of relevant International Classification of Disease (ICD) codes used to identify each condition is provided in Appendix B (http://www.sjweh.fi/data_repository.php). It should be noted that this method of identifying conditions will not detect undiagnosed conditions and will potentially exclude people with early or mild forms of the diseases or well-controlled disorders that do not require monitoring or continuous treatment as these individuals will not necessarily have had two medical visits for the condition within a two-year period.

Covariates

Covariates in our analyses included occupational strength requirements (light, limited, moderate, heavy), and if the primary body position of the occupation involved bending, stooping, kneeling or crouching (yes/no). These characteristics were assigned to each claimant using the National Occupational Classification title as recorded by WorkSafeBC (19, 20). We also included (i) the industry sector in which the claimant was employed when injured (primary resources, manufacturing, construction, transportation/warehousing, trade, public sector, services sector, other industry sectors); (ii) the part of the body injured (neck, throat, or upper extremity, trunk, lower extremity, other body parts including injuries to multiple body parts); (iii) if they had a previous claim with WorkSafeBC in the two years before the current claim; and (iv) the time period in which the injury occurred (1997–1998, 2001–2002, 2005–2006).

Analysis

A path modeling approach examined the relationship between age, pre-existing chronic conditions, and length of SA (21–23). This approach provides distinct advantages over traditional regression techniques for questions of mediation as it allows for generation of a specific estimate of the relationship between age and absence from work attributable to each pre-existing condition simultaneously in the model (24, 25). In addition, it allows covariances to be specified in the model so that assumptions of independence between all variables do not have to be made. SAS version 9.3 (SAS Institute, Cary, NC, USA) was used for the descriptive analyses, and Mplus version 6.12 for the path analyses (21). As differences in the factors associated with return to work have been found for men and women (26, 27) all analyses were stratified by gender. In addition to describing the distribution of days of absence, chronic conditions, and hospitalization status, the descriptive analyses included a cross-tabulation of chronic conditions and hospitalization status by age groups. The original sample of claims submitted to WorkSafeBC in 1997–1998, 2001–2002, and 2005–2006 totaled 398 018, of which 164 563 (41%) were MSD claims. Of this number 1941 (1%) were missing information on study variables and were removed; 5743 (3.5%) claims were for long-term disability (LTD) and did not have counts of wage replacement days. Finally, 45 605 (27.7%) claims were excluded from the analyses as they were a second MSD claim for the same claimant during the study time period, which left a final sample of 111 274 claims for analyses.

Path analyses were used to estimate the direct effects of age on days of absence and the indirect effects between age and days of absence via each type of chronic condition. We log transformed days away from work (the outcome) to ensure that its distribution was approximately normal. Model fit was assessed using comparative fit indices, which measure the relative improvement in the overall fit of the model compared to a model assuming all observed variables are uncorrelated. Good model fit is indicated by a Comparative Fit Index (CFI) >0.90 and Tucker-Lewis Index (TLI) >0.90. We also used population-based model fit indexes, which adjust the relative fit of the model for model complexity. Good model fit is indicated by a Root Mean Square Error of Approximation (RMSEA) upper bound <0.08.

As rheumatoid arthritis, thyroid, and hearing disorders were not associated with differences in duration of absence among either men or women, these variables were removed from the path model in order to improve the model fit. In addition, correlations between the errors of some chronic conditions were added to improve the fit of the model. After making these modifications, the model for men had a CFI of 0.97, TLI of 0.95, and

RMSEA of 0.007 (upper bound = 0.008). The model for women had a CFI of 0.97, a TLI of 0.94 and RMSEA of 0.007 (upper bound = 0.008). A subsequent model was also run with age treated as a continuous variable (in ten-year increments) to provide a summary statistic for the effects of chronic conditions on length of SA across age, assuming the underlying relationship between age and length of SA is linear.

Results

Table 1 presents descriptive information on the mean, median, and 25th and 75th percentiles of days of SA over the two-year period following injury by age group and pre-existing chronic condition. Older age was associated with greater median days of SA although the shape of the relationship differed for men and women. Among men, mean and median days of SA increased with increasing age whereas, among women, the highest median days of SA were observed among 35–44- and 45–54-year-olds, with the mean and median days of SA among ≥55-year-old women similar to that of 25–34-year-olds. The largest median differences in days of SA among comorbid conditions were for diabetes (6 days difference in median among men and women), coronary heart disease (5 days difference among women and 4 days among men), and osteoarthritis (4 days difference among men and 2 days among women).

Table 2 presents the percentage of pre-existing chronic conditions across age groups for men and women. Hypertension, coronary heart disease, osteoarthritis, and diabetes were the conditions with the largest relative differences among the oldest compared to youngest age group for both men and women. The prevalence of depression was higher among women than men and peaked in the middle age groups.

Table 3 presents the direct effects of age and different chronic conditions on days of SA, adjusted for time period of injury, having a previous claim, part of body injured, occupational characteristics, and industry of employment when injured. An estimate of the relative effect for each variable on days of SA, calculated using methods that adjust for the log transformation of the outcome (28), can also be found in table 3. Similar to the age trends

Table 1. Descriptive information on days of sickness absence over the two years following an injury by age group and pre-existing chronic condition. WorkSafe BC claimants with musculoskeletal injuries in 1997–1998, 2001–2002 or 2005–2006.

	Males (N=70 763)						Females (N=40 511)					
	N	%	Mean	Median	25th percentile	75th percentile	N	%	Mean	Median	25th percentile	75th percentile
Age group (years)												
15–24	10 890	15.4	18	7	3	20	4639	11.5	25	9	3	30
25–34	18 718	26.5	25	9	4	29	8865	21.9	37	14	4	46
35–44	20 932	29.6	30	11	4	36	12 655	31.2	42	17	5	55
45–54	14 394	20.3	32	13	5	38	10 559	26.1	42	17	5	54
≥55	5829	8.2	35	15	5	43	3793	9.4	38	15	5	47
Osteoarthritis												
Yes	1758	2.5	34	14	5	42	1280	3.2	45	17	5	54
No	69 005	97.5	28	10	4	32	39 231	96.8	38	15	4	49
Rheumatoid arthritis												
Yes	328	0.5	33	12	5	36	444	1.1	47	17	5	54
No	70 435	99.5	28	10	4	32	40 067	98.9	39	15	4	49
Diabetes												
Yes	1798	2.5	34	16	5	42	1108	2.7	44	21	6	59
No	68 965	97.5	28	10	4	32	39 403	97.3	38	15	4	49
Hypertension												
Yes	4042	5.7	33	13	5	39	3074	7.6	41	16	5	53
No	66 721	94.3	28	10	4	32	37 437	92.4	38	15	4	49
Coronary heart disease												
Yes	1855	2.6	35	14	5	43	874	2.2	46	20	5	58
No	68 908	97.4	28	10	4	32	39 637	97.8	38	15	4	49
Hearing												
Yes	632	0.9	32	13	4	38	342	0.8	37	16	4	56
No	70 131	99.1	28	10	4	32	40 169	99.2	39	15	4	49
Depression												
Yes	5398	7.6	31	11	4	38	7645	18.9	41	16	5	54
No	65 365	92.4	28	10	4	32	32 866	81.1	38	15	4	48
Thyroid conditions												
Yes	615	0.9	35	11	4	41	2197	5.4	40	16	4	52
No	70 148	99.1	28	10	4	32	38 314	94.6	39	15	4	49

observed in table 1, the coefficients for age increased with increasing age among men and followed an "inverse U" shape among women, peaking at 35–44 years of age. Pre-existing diabetes and depression were associated with greater days of absence among men and women, with a relative increase in days of SA of 7% for men and women with diabetes, and 3.5% for men and 3.4% for women with depression. Pre-existing coronary heart disease was associated with greater days of SA among women but not men while pre-existing osteoarthritis was associated with greater days of SA among men but not women.

Table 2. Percentage of pre-existing chronic health conditions across age groups, stratified by gender. WorkSafe BC claimants with MSK injuries in 1997–98, 2001–02 or 2005–06.

	Age (years)				
	15–24	25–34	35–44	45–54	≥55
Males					
Osteoarthritis	0.4	0.9	2.1	4.4	8.0
Rheumatoid arthritis	0.2	0.2	0.4	0.9	1.1
Diabetes	0.3	0.7	1.8	4.4	10.3
Hypertension	0.4	1.2	3.9	11.0	23.4
Coronary heart disease	0.3	0.5	1.7	5.0	11.5
Hearing	0.3	0.5	0.8	1.4	2.5
Depression	5.5	6.9	8.5	8.8	7.7
Thyroid disorders	0.3	0.4	0.9	1.4	2.2
Females					
Osteoarthritis	0.5	0.8	2.1	4.9	10.5
Rheumatoid arthritis	0.5	0.6	1.1	1.5	2.0
Diabetes	0.5	1.5	2.4	4.0	6.0
Hypertension	1.0	2.3	4.7	12.5	24.0
Coronary heart disease	0.4	0.6	1.2	3.5	7.4
Hearing	0.6	0.7	0.7	1.0	1.5
Depression	14.6	18.9	20.7	19.8	15.2
Thyroid disorders	1.5	3.4	5.5	7.2	9.7

Table 4 presents the estimates for the total, direct, and indirect (via chronic conditions) effects for each age group on days of absence (relative to 15–24-year-olds). On the right hand side of the table are estimates from the path model where age was entered as a continuous variable. The top portion of each segment of the table presents the standardized effect estimates, while the bottom portion presents the percentage of the total effect, with each age group that is accounted for (mediated) by chronic conditions. This number is estimated by dividing the sum of the indirect effects for chronic conditions within each age group by total effects of age (noting the sum of the direct and indirect effects is equal to the total effect). Pre-existing chronic conditions accounted for 11–28% of the total effects of age. Among both men and women, the relative importance of chronic conditions increased with age due to the increasing prevalence of these conditions (with the exception of depression) among older claimants. The estimates from the model of using continuous age (where the relationship between age and days of wage replacement appears to be somewhat linear) suggest that pre-existing chronic conditions (specifically diabetes, osteoarthritis, and depression) account for 22% of the effect of age on days of SA among men.

Discussion

The objective of this paper was to examine the relative contribution of pre-existing chronic conditions to age differences in days of SA following a musculoskeletal injury in British Columbia. The relationship between age

Table 3. Direct effects of age and chronic conditions on days of sickness absence over the two years following an injury. WorkSafeBC short-term disability claimants with musculoskeletal injuries in 1997–1998, 2001–2002 or 2005–2006. Estimates have been adjusted for pre-injury claim, part of body, occupational strength requirements, occupational body position, industry sector and time period of injury. [SE=standard error]

	Males				Females			
	Unstandardized estimate	SE	Standardized estimate	Relative increase [a] (%)	Unstandardized estimate	SE	Standardized estimate	Relative increase [a] (%)
Age (years)								
15–24	reference		reference		reference		reference	
25–34	0.209 [b]	0.018	0.153	23.2	0.304 [b]	0.031	0.205	35.5
35–44	0.354 [b]	0.021	0.256	42.5	0.403 [b]	0.032	0.267	49.6
45–54	0.419 [b]	0.027	0.300	52.0	0.395 [b]	0.038	0.257	48.4
≥55	0.520 [b]	0.036	0.370	68.2	0.307 [b]	0.049	0.195	35.9
Chronic conditions								
Osteoarthritis	0.043 [c]	0.014	0.033	4.4	0.032	0.019	0.023	3.3
Diabetes	0.066 [b]	0.016	0.052	6.8	0.066 [c]	0.023	0.045	6.8
Hypertension	0.001	0.015	0.001	0.1	-0.035	0.019	-0.026	-3.4
Coronary heart disease	-0.004	0.017	-0.003	-0.4	0.057 [c]	0.025	0.040	5.9
Depression	0.034 [b]	0.009	0.025	3.5	0.033 [c]	0.011	0.022	3.4

a Relative increase in days of sickness absence compared to the reference category.
b $P<0.001$.
c $P<0.05$.

Table 4. Direct, indirect and total (standardised) effects of age group and chronic conditions on days of sickness absence over the two years following an musculoskeletal injury. WorkSafeBC short-term disability claimants in 1997–1998, 2001–2002 or 2005–2006. Estimates have been adjusted for pre-injury claim, part of body, occupational strength requirements, occupational body position, industry sector and time period of injury.

	15–24 years	25–34 years	%	35–44 years	%	45–54 years	%	≥55 years	%	Continuous Age [a]	%
Males											
Effect estimates											
Total	ref	0.175 [a]		0.308 [a]		0.381 [a]		0.480 [a]		0.140 [a]	
Direct	ref	0.153 [a]		0.256 [a]		0.300 [a]		0.370 [a]		0.032 [a]	
Chronic conditions											
Osteoarthritis	ref	0.007 [b]		0.017 [b]		0.029 [b]		0.039 [b]		0.012 [b]	
Diabetes	ref	0.014 [b]		0.030 [a]		0.046 [a]		0.068 [a]		0.018 [b]	
Hypertension	ref	0.000		0.000		0.002		0.004		-0.002	
Coronary heart disease	ref	0.000		-0.002		-0.002		-0.004		0.002	
Depression	ref	0.002 [b]		0.007 [b]		0.005 [b]		0.004 [b]		0.001 [b]	
Percentages of total effect											
Direct effect			87.0		83.1		78.8		77.0		77.9
Indirect effect (via chronic conditions)			13.0		16.9		21.2		23.0		22.1
Females											
Effect estimates											
Total	ref	0.230 [a]		0.308 [a]		0.319 [a]		0.270 [a]		0.077 [a]	
Direct	ref	0.205 [a]		0.267 [a]		0.257 [a]		0.195 [a]		0.054 [a]	
Chronic conditions											
Osteoarthritis	ref	0.005		0.011		0.020		0.026		0.009	
Diabetes	ref	0.017 [b]		0.026 [b]		0.033 [b]		0.043 [b]		0.011 [b]	
Hypertension	ref	-0.007		-0.015		-0.027		-0.036		-0.013 [b]	
Coronary heart disease	ref	0.005		0.015 [b]		0.031 [b]		0.043 [b]		0.016 [b]	
Depression	ref	0.005 [b]		0.004 [b]		0.004 [b]		0.000		0.000	
Percentages of total effect											
Direct effect			89.2		86.7		80.4		72.0		70.1
Indirect effect (via chronic conditions)			10.8		13.3		19.6		28.0		29.9

[a] Estimate for increase in days of wage replacement for each 10-year increase in age.
[a] P<0.001.
[b] P<0.05.

and length of SA differed for men and women. Among men, days of SA increased as age increased although, among women, days of SA followed an inverse U relationship – increasing up to 35–44 years of age, with a noticeable decline in the effect of age in the oldest age group (≥55 years). Pre-existing diabetes was associated with older age among both men and women and also associated with greater days of SA. Osteoarthritis was associated with age and days of SA among men but not women, and coronary heart disease was associated with age and greater days of SA among women but not men. Depression was associated with more days of SA, although prevalence peaked in the middle age groups where it accounted for 1–2% of age differences. Among men, where the relationship between age and days of SA was somewhat linear, pre-existing osteoarthritis, diabetes, and depression mediate 22% of the total effect of age on SA. A similar summary estimate is not appropriate for women – given that the relationship between age and days of SA was not linear. Among women 35–54 years (where days of SA are highest), the percentage of the total age effect that can be attributed to diabetes, coronary heart disease, and depression was 13–20%. These results suggest that diabetes in particular, as well as osteoarthritis among men and coronary heart disease among women, are potentially important mediators in the relationship between age and SA following a work-related MSD injury.

The results of this study, however, should be interpreted acknowledging the following limitations. Our assessment of SA following an injury was done using wage replacement payments. It is possible that the cessation of compensation payments may not always be associated with a return to work (eg, if a worker retires, or if they are encouraged to report they are back at work when they are not). Previous studies report differences between self-reported days of absence and administrative estimates, although age was not strongly associated with these differences (29). As such, it is unlikely that using self-reported days of absence as our outcome would have changed the estimates associated with age in our models. We identified chronic conditions using administrative healthcare billing and hospitalization data. As a result the chronic conditions identified are only those requiring ongoing treatment.

Our study also has a number of strengths. We had access to a large sample of claims from a monopoly provincial workers' compensation insurer, with a variety of detailed information on injury characteristics, pre-injury occupation, and industry information. In addition, through a unique data linkage, we were able to identify pre-existing chronic conditions using six years of administrative medical billing and hospitalization information. This data, along with our sophisticated analytical methods, allowed for one of the first examinations of the impact of a variety of pre-existing health conditions on age differences in SA following a MSD injury.

It should be noted that in this paper we have only examined short-term disability claims. In British Columbia all wage replacement claims are classified as short-term disability up to the point it is determined that the worker is unlikely to ever be able to return to work. In this instance, claims are then classified as long-term disability. The timing of this determination varies from claim to claim. Once a claim is classified as long-term disability, days of wage replacement are no longer captured in the WorkSafeBC claims database, and as such we had to exclude these claims from our analysis. Since long-term disability claims reflect (by definition) people who would be away from work for very long periods (in most cases, indefinitely), this exclusion may have biased our results towards the null.

We did run supplemental path models with a dichotomous outcome (long- versus short-term disability). These models indicated a direct, positive relationship between age and the risk of a long-term disability claim for both men and women, which was stronger than the relationship observed for days of wage replacement. It is, therefore, possible that the estimated effects of age on days of wage replacement would have been larger if we had been able to generate a value for days of wage replacement for the long-term disability claims and include these claims in our analysis. Osteoarthritis was the only condition associated with an increased risk of a long-term disability claim among men and women, although depression and hearing loss were also associated with increased risk of long-term disability claims among female respondents only. Details of these models are available from the authors on request.

Our results are incongruent with the review by Laisne and colleagues (14), which reported strong evidence of no relationship between comorbidity and labor market participation outcomes after musculoskeletal injuries. We suggest that this difference is likely due to a general measure of comorbidity being used in many previous studies examining the effect of comorbidity on absence from work. In our study, we found that while some pre-existing chronic conditions associated with age were associated with longer SA (eg, diabetes, osteoarthritis, coronary heart disease), others were not (eg, hypertension). We also observed that, chronic conditions that are episodic in nature (rheumatoid arthritis and thyroid conditions) were not associated with increases in days of SA among men or women, and this could reflect differences in the medical management for these episodic conditions, which in turn lessens the impact of these conditions on days of absence following injury. Had we used a general measure of comorbidity, we may not have detected these important variations in the effects of specific chronic conditions.

We unfortunately were unable to examine the relative contribution of differences in injury severity on age differences in SA. Using a survey of 1032 wage replacement work-injury claimants in New Hampshire, Pransky and colleagues (11) previously reported that age differences (comparing workers ≥55 to those <55 years) in return to work at 6–9 weeks post-injury were completely attenuated after adjustment for self-reported injury severity, undergoing injury-related surgery, and the worse physical component scores of the SF-12, with each of these factors being more prevalent among the older age group. We did run additional models that examined the relationship between age and injury-related in-patient hospitalizations and days of age replacement. These models found that while only a small number of claimants (3.4% of men and 1.4% of women) had injury-related in-patient hospitalizations in the two-year period following the work injury, these were more common among older workers and explained a greater proportion of age differences in days of compensation than did pre-existing chronic conditions. However, there was still a large proportion of the total effect of age group left unexplained. The challenge associated with disentangling the temporal sequence between hospitalization and days of SA (eg, is having more days of SA the predictor of being recommended for surgery) resulted in us not using in-patient hospitalizations as a marker of injury severity (results of these models are available from the authors on request).

We found differences in the relationship between age and days of SA for men and women in our sample. In particular, women ≥55 years had similar days away from work compared to women 25–34 years of age, and fewer days away from work than women 35–54 years of age. Conversely, among men, the relationship between age and days of SA was monotonic. This difference could be due to either fewer days of absence for younger males relative to younger females or fewer days of absence among older females relative to older males. The descriptive information presented in table 1 suggests that female-to-male differences in absence from work are greatest in the middle-age groups (25–54 years of age). Women returning to work after injury are more likely than men to be engaged in dual roles, balancing family responsibilities with rehabilitation priorities (30), and these differences may be greatest among these age groups, leading to differences in the relationship between age and days of absence between men and women. Given that older workers make up a larger proportion of the total number of compensation claimants, research should explore in more detail gender differences in the relationship between age and days away from work to better understand this relationship.

In conclusion, this study has demonstrated that age differences in days of absence following a work-related musculoskeletal injury are mediated through a greater prevalence of diabetes among older men and women, although a substantial proportion of the effect of age remains unexplained. Greater prevalence of coronary heart disease also mediated age differences among older women but not older men as did osteoarthritis among men but not women. Pre-existing depression was also related to longer SA, but the prevalence of depression did not increase with age. As highlighted in the introduction, workers' compensation agencies are dealing with an increasing number of claims from older workers. Given the high prevalence of diabetes among older workers, coupled with large recent increases in this disease (31), future work in this area should test the specific mechanisms (eg, inflammatory pathways, increased stiffness in joints) through which diabetes (and other specific conditions for men and women) increases subsequent days of SA following a MSD injury.

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