Occupational Medicine 2016;**66**:698–705
doi:10.1093/occmed/kqw168

Examining age differences in duration of wage replacement by injury characteristics

J. K. Fan[1,2], O. Black[3] and P. M. Smith[1,2,3]

[1]Institute for Work & Health, Toronto, Ontario M5G 2E9, Canada, [2]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario M5T 3M7, Canada, [3]School of Public Health and Preventive Medicine, Monash University, Alfred Hospital, Melbourne, Victoria 3004, Australia.

Correspondence to: J. K. Fan, Institute for Work & Health, 481 University Avenue, Toronto, Ontario M5G 2E9, Canada. E-mail: jfan@iwh.on.ca

Background One explanation for why older age is associated with greater duration of wage replacement following a work-related injury may be that older workers sustain more severe injuries and different types of injury compared with their younger counterparts.

Aims To examine the role of injury-related characteristics in explaining the impact of age on wage replacement duration, and whether the relationship between age and wage replacement duration is consistent across injury types and levels of severity.

Methods A secondary analysis of workers' compensation claims in the Australian state of Victoria. In Victoria, only injuries which have accumulated >10 days of wage replacement, or have health care expenditures above a financial threshold, are eligible for compensation. Nested regression models were used to examine the relative contribution of injury-related characteristics to age differences in wage replacement duration.

Results Older age was associated with greater days of wage replacement among men and women, even after adjusting for injury characteristics. Adjustment for differences in injury types and compensation reporting practices resulted in moderate attenuation of the age–duration relationship among men and small attenuation among women. The age–duration relationship was consistent across injury types/severity.

Conclusions The relationship between older age and greater duration of wage replacement is ubiquitous across injuries of different types and severity. Future research is required to understand better why older age is consistently associated with worse compensation outcomes following work-related injury.

Key words Older workers; return to work; work-related injury; workers' compensation.

Introduction

Ageing workers represent one of the fastest growing segments of the labour force in many countries [1]. In Australia, for example, there has been a steady increase in the age of the working population over the past two decades [2], largely due to an ageing of the population as a whole, as well as through increased labour market participation rates among older Australians. People aged over 55 now comprise 16% of the Australian labour market [2]. These demographic and labour market changes have also been observed in other countries such as Canada and the UK [1]. In Canada, the proportion of workers aged over 55 increased from 15 to 19% over the 2006–11 period [3], while in the UK, the proportion of workers aged over 50 increased from 26 to 28% over the same period [4]. This increase in the age of the labour market has also been reflected in the prevalence of work-related injuries. For example, in Australia, data on self-reported work-related injuries demonstrate an increase of 9% in the number of injuries among workers aged over 50 between 2005/06 and 2009/10 (from ~153 700 to 168 400 injuries). Over this same period, the number of injuries among workers aged 35–49 and under 35 has decreased by 8 and 15%, respectively [5]. There is also substantial evidence that older workers experience worse return-to-work (RTW) outcomes following work-related injury [6–10], including a decreased likelihood of RTW [6], increased odds of having disability recurrences [6] and a greater wage loss duration [9]. However, despite these well-documented age gradients in work disability outcomes across countries, the underlying mechanisms driving these relationships have yet to be fully elucidated.

Previous studies have examined the role of various individual-level factors in mediating the relationship between age and disability duration, such as chronic conditions [7] or pain experiences [11]. For example, some studies have observed that a greater number of pre-existing chronic conditions among older workers (such as diabetes, osteoarthritis and coronary heart disease) partially explains why older chronological age is associated with longer disability duration [7,11]. However, even after accounting for these indirect pathways, a substantial proportion of the age–duration relationship remains unexplained [7]. Given the strong body of evidence demonstrating that older workers experience more severe injuries and different types of injuries compared with younger workers in many countries [12–14], one hypothesis is that age-related differences in these injury characteristics may partly explain the relationship between age and post-injury outcomes. For example, a US study of 1032 work injury claimants in New Hampshire [15] reported that age differences in RTW and reduced work hours were attenuated to non-significance after adjustment for self-reported severity, undergoing injury-related surgery and having worse physical functioning scores.

In Victoria, Australia, the workers' compensation system (WorkSafe Victoria) compensates ~85% of the labour market for wage replacement and health care expenditures associated with work-related injuries and illnesses. While the underlying principles are similar to other jurisdictions in Australia, there are unique features of the Victorian system that may affect the relationship between age and work-related injury outcomes [16]. In Victoria, almost all employers are required to cover wage replacement costs for work-related injuries for the first 10 days of absence, and for health care costs below a certain threshold ($610 AUD in the fiscal year 2011/12). It is only after these limits have been exceeded that WorkSafe Victoria, and its associated claims agents, become actively involved in the claims process. In the context of an ageing labour market, developing a better understanding of the factors that link older age to longer absence duration is required to facilitate the identification of target points for interventions [17]. Given the restrictions on workers' compensation in Victoria, we would expect that age differences in severity would be less pronounced among these claimants. This provides an opportunity to examine the relationship between age and injury severity when initial severity is similar, as well as the relative contribution of severity to age differences in wage replacement duration. We also examine the impact of other factors such as type of injury sustained and the time between injury and certification of incapacity, and whether these characteristics explain age differences in wage replacement duration. Finally, we examine if the age–duration relationship is more or less pronounced for particular injury types, or when severity is lower or higher. If the age–duration relationship differs across injury types or severity, then this might indicate that injury-specific characteristics (e.g. physiological recovery or healing) may be relevant to better understanding why older age is associated with longer wage replacement duration.

Methods

This study is a secondary analysis of wage replacement claims reported to WorkSafe Victoria. Data access was facilitated through the Compensation Research Database, which is housed by the Institute for Safety, Compensation and Recovery Research, a joint collaboration between WorkSafe Victoria, the Transportation Accident Commission and Monash University. We focused on all physical injuries and illnesses affecting employees with an injury date between 2005 and 2011 inclusive and resulting in over 10 days of wage replacement (n = 78 465). Ethical approval was obtained through the Monash University Human Research Ethics Committee. Our primary outcome was the number of days of total wage replacement by WorkSafe Victoria over a 1-year period following the first day of work incapacity. The first day of incapacity corresponds to the first day of work absence that is deemed to be due to the current injury or illness, obtained from the certificate of incapacity given to each claimant by the treating health care provider. For this study, we totalled the days of compensation where the worker was either unable to work or had some work capacity but was not working (e.g. no suitable job was available). We excluded days where the worker had returned to work but was being paid less than pre-injury earnings. As the outcome variable was positively skewed, it was log-transformed for our analyses. Our primary explanatory variable was chronological age at time of injury (categorical: 15–24, 25–34, 35–44, 45–54, 55+ years).

Injury severity was measured using two administrative outcomes. First, claimants were classified as having received in-patient hospital or health care services related to their injury or illness in the 30-day period following incapacity (yes/no). Second, for each claimant, we calculated the total amount of health care expenditure received from general practitioners and allied health care providers in the 30-day period following incapacity (four quartiles plus a 'zero' category). Values were adjusted to 2011/12 dollars using the Consumer Price Index for Medical Expenses in Melbourne [18]. Our assumption was that severe injuries are more likely to have in-patient hospitalizations and greater expenditure in the first 30 days post-injury. However, we recognize that residual differences in severity may exist within these broad categories and that expenditure may be influenced by other factors such as co-existing conditions or standards of care [19]. We also note that severity may be measured using a variety of constructs with no consensus in the definition [20]. Nevertheless, early hospitalization and expenditure in the first month post-injury have been described as readily available markers of severity in the absence of detailed diagnosis codes or trauma registry data [19]. Moreover, these measures have been validated for prediction of work disability outcomes in previous studies [10,19].

In our fully adjusted models, we included variables to describe the injury type sustained and the time between injury occurrence and incapacity (categorical: 0–2, 3–7, 8–14, 15–30, 31–90 days). Injury type was categorized into broad groups based on TOOCS [21] codes: intracranial, nerve/spinal; fractures; wounds/burns; traumatic joint, ligament or tendon; chronic musculoskeletal injury (MSI); hernias and all other types. We also included the primary body part injured (head/neck, trunk, upper/lower limbs, multiple locations, other). Claims with over 90 days between injury and incapacity (n = 9312) were excluded given that these are likely to represent a subset of claims with a different aetiology and prognosis. Covariates included whether the claimant had a previous claim within 2 years of the current injury (yes/no); pre-injury employment status (full/part-time); employer size (small: <\$1 million AUD in remuneration; medium: \$1–20 million; large: >\$20 million and/or government employer); workplace industry (Australia and New Zealand Standard Industrial Classification broad division codes); occupational strength requirements, derived from the Australia and New Zealand Standard Classification of Occupation (Australian Bureau of Statistics, Canberra, Australia) codes (limited: handling loads <5 kg; light: 5–10 kg; medium: 10–20 kg; heavy: >20 kg), and year of incapacity.

Descriptive analyses examined age differences in the distribution of injury characteristics, as well as differences in the median number of compensation days across main study variables. Examination of the impact of injury characteristics on the relationship between age and wage replacement days was completed using a nested regression modelling approach. This approach has been previously outlined by Baron and Kenny [22] and is suitable for understanding the relative importance of mediators when using an ordinary least squares model and where the outcome of interest is normally distributed [23]. In this approach, a baseline model is examined which includes the primary independent variable (age) and all covariates. A second model then examines the inclusion of a mediator of interest (injury severity); if a variable is entered into the model that is related to the independent variable and the outcome of interest (wage replacement days), then the result will be a change in the coefficients for the independent variable. We also examined a model including injury type and days between injury and incapacity. Given the log-transformation of our outcome variable, estimates for the relative increase in wage replacement days across age groups are presented along with the regression coefficients; these were calculated by taking the exponent of the coefficient and subtracting '1' [24]. A final series of models examined whether the relationship between age and wage replacement days differed across injury type and severity categories by including a statistical interaction term in the model; evidence for effect-measure modification in the age–duration relationship was assessed by testing the statistical significance of this term and by examining the age estimates across levels of the third variable. Due to differences in the RTW process for men and women [25], all analyses were stratified by gender.

Results

The initial sample of physical injury claims with over 10 days of wage replacement in the year following incapacity, injury date between 2005 and 2011 and ≤90 days between injury and incapacity, totalled 67 142. From this sample, we removed claims that were terminated within a year of injury due to reasons other than RTW (n = 6335) and those with under 365 calendar days between the first day of incapacity and 31 December 2012 (n = 100). We additionally removed claims with common-law entitlements (n = 2194) and claims from the same claimant lodged within the study period (n = 3906), resulting in a final analytic sample of 54 607 claims (71% of all standard claims). A logistic regression analysis examined the impact of these exclusions on our study sample, with these restrictions resulting in a younger sample of claimants with less severe injury types compared with the initial sample. Our final analytic sample included 37 820 men and 16 787 women (Table 1). Expected relationships were observed, with older age, hospitalization (among women only) and greater expenditure in the first 30 days being associated with greater median days of wage replacement over the year following incapacity.

Figure 1 presents the relationships between age and injury severity/type. Among men, younger workers had a higher prevalence of our measures of severity (22.5 versus 17.3% for ages 15–24 and 55 or over, respectively; $P < 0.001$); whereas among women, this relationship was less clear, with the highest levels of expenditure observed among the youngest and oldest age groups. There were also statistically significant differences in the distribution of injury types across age groups. For example, younger men and women had a higher prevalence of wounds/burns, whereas workers in the middle age groups had a higher prevalence of chronic MSI.

Table 2 presents the results of our nested regression models examining the relative importance of injury severity on the relationship between age and wage replacement days. Adjustment for severity (Model 2) did not change the observed relationship between age and duration. For example, the estimated increase in log-transformed days

Table 1. Number (%), median and 25th and 75th percentiles of days of wage replacement in the year following first day of incapacity, by gender

	Men (n = 37 820)		Women (n = 16 787)	
	n (%)	Median days (IQR)	n (%)	Median days (IQR)
Age, years				
15–24	3491 (9)	25 (10–57)	1212 (7)	21 (8–54)
25–34	7656 (20)	29 (11–65)	2506 (15)	23 (9–59)
35–44	9770 (26)	30 (12–74)	3807 (23)	30 (10–82)
45–54	9802 (26)	31 (13–79)	5796 (35)	31 (11–78)
55+	7101 (19)	37 (15–92)	3466 (21)	31 (12–77)
Hospital services, first 30 days				
No	31 337 (83)	31 (12–77)	15 525 (92)	29 (10–75)
Yes	6483 (17)	30 (13–66)	1262 (8)	34 (14–76)
Health care expenditures, first 30 days				
None	14 831 (39)	26 (9–66)	7553 (45)	24 (8–64)
Lowest quartile	5044 (13)	34 (14–86)	3012 (18)	31 (12–78.5)
2nd quartile	5375 (14)	34 (14–85)	2681 (16)	31 (12–88)
3rd quartile	5812 (15)	33 (14–75)	2244 (13)	35 (14–85)
Highest quartile	6758 (18)	35 (15–77)	1297 (8)	38 (17–85)
Injury type				
Intracranial	209 (1)	38 (15–109)	105 (1)	18 (6–76)
Fracture	5554 (15)	40 (18–82)	2357 (14)	33 (15–66)
Wounds and burns	7855 (21)	21 (8–46)	2089 (12)	18 (8–53)
Traumatic joint, ligament or tendon	6510 (17)	34 (14–81)	2890 (17)	29 (11–77)
Chronic musculoskeletal	14 138 (37)	35 (12–99)	8846 (53)	30 (11–85)
Hernias	2506 (7)	23 (13–40)	111 (1)	27 (16–45)
Other	1048 (3)	34 (12–94)	389 (2)	25 (10–69)
Days between injury and incapacity dates				
0–2	23 076 (61)	30 (12–73)	9212 (55)	26 (9–67)
3–7	5872 (16)	29 (11–73)	3081 (18)	27 (10–75)
8–14	2817 (7)	31 (14–79)	1433 (9)	30 (12–78)
15–30	2644 (7)	37 (15–90)	1416 (8)	36 (14–90)
31–90	3411 (9)	31 (14–79)	1645 (10)	41 (15–102)

WorkSafe Victoria claimants with injury dates between 2005 and 2011 (n = 54 607). IQR, interquartile range.

of wage replacement for men aged 55 or over (compared with 15–24 years) was 0.487 in the covariate-adjusted model and 0.486 in the model additionally adjusted for severity. Further adjustment for injury type and days between injury and incapacity (Model 3) attenuated the age estimates among men and women, with the attenuation being more pronounced among men in the younger/middle age groups (e.g. 36% reduction in the coefficient for men aged 25–34 years) compared with women (e.g. 13–16% reduction across age groups).

We also examined the relationship between age and wage replacement duration across injury types and severity. For men and women, there was a consistent pattern of older age and longer duration across each of the injury-specific models (Figure 2). Cross-product terms for statistical interaction between age and injury type/severity were not statistically significant in the fully adjusted models.

Discussion

Our study found that older age was associated with greater days of wage replacement in the covariate-adjusted models. Moreover, this age–duration relationship persisted after accounting for age differences in injury type, severity and compensation reporting practices, and thus we did not find evidence that the relationship was attenuated to a large extent. We also observed that the impact of age on wage replacement duration was similar across different injury types and levels of severity, with no statistical evidence of effect-measure modification by injury characteristics.

Previous studies have observed that older workers experience more severe injuries and different types of injuries when compared with their younger counterparts [12–14], and that work-disability outcomes vary substantially depending on the nature or severity of injury [6,9,19,26]. In our study, older age was not associated with more severe injuries within the context of the Victorian compensation system, probably due to the disability/expenditure thresholds required to report an injury for compensation. As a result, adjustment for differences in our two markers of severity had minimal impact on age differences in wage replacement. We did, however, observe a number

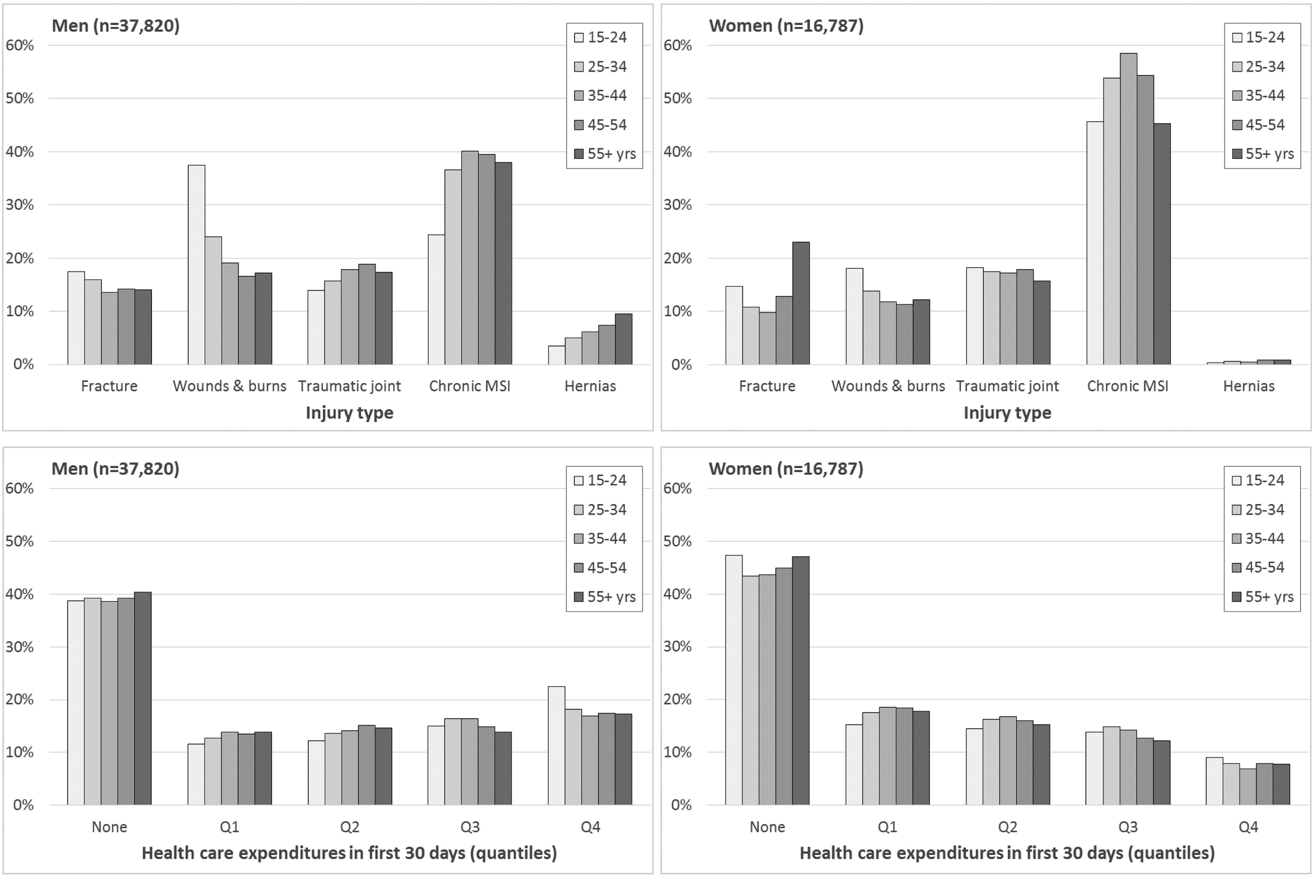

Figure 1. Relationship between age groups and injury type (top two panels) and severity (bottom two panels), by gender. WorkSafe Victoria claimants with injury dates between 2005 and 2011 (n = 54607). (i) Traumatic joint: traumatic injuries to joints, ligaments or tendons. (ii) Q1: lowest expenditures; Q4: highest expenditures. (iii) Figures exclude the small proportion of claims with intracranial (0.6%) and other (2.6%) injury types.

of age-related differences in the distribution of injury types. Among younger men, for example, there was a similar prevalence of fracture and traumatic musculoskeletal conditions compared with other age groups (with these injuries associated with longer wage replacement duration), a lower prevalence of chronic MSI and a higher prevalence of wounds/burns. Accordingly, adjustment for differences in injury type resulted in moderate attenuation of age effects among men (with the greatest impact in the younger/middle age groups) and small attenuation among women. Thus, our findings are consistent with some [9,10], but not all [15] studies observing that age differences in disability duration and RTW outcomes persist after accounting for the impact of injury characteristics. There may be other potential mechanisms that explain why older workers have greater wage loss duration following work-related injury. For example, previous studies have demonstrated that a greater prevalence of pre-existing chronic conditions among older workers partly explains the observed age gradient in disability duration [7]. However, a substantial proportion of the effect of age remains unexplained after accounting for these indirect pathways [7]. Older workers may also have differences in health status or reduced functional capacity, resulting in delayed recovery. There may also be age-related differences in psychosocial factors or offers/acceptance of modified duties in the workplace, which in turn may have an impact on disability duration [13,27,28]. These variables are not routinely collected in our administrative data sources and therefore could not be included in our analyses.

In our study, we also observed that the age estimates for wage replacement duration were similar in magnitude across each of the injury-specific models. Only a few studies have examined whether the age–duration relationship varies across injury conditions as the main analytical focus, with one study observing that older age was associated with longer duration for both musculoskeletal and mental health claim types [26]. However, the majority of studies have tended to focus on this relationship using selective cohorts with specific injury conditions. Given that we found no statistical evidence of an effect-measure modification of the age estimates by injury type or severity, our current findings suggest that older age is persistently associated with longer disability duration and that injury-specific recovery or treatment processes may play less of a role in this observed relationship.

Table 2. Ordinary least squares regression estimates for days of wage replacement (log-transformed) in the year following first day of incapacity across age groups

	Men				Women			
	Coefficient	95% CI	% change in coefficient[a]	Relative increase in mean days (%)[b]	Coefficient	95% CI	% change in coefficient[a]	Relative increase in mean days (%)[b]
Model 1: adjusted for covariates only[c]								
15–24	Ref.			Ref.	Ref.			Ref.
25–34	0.167	0.11–0.22		18	0.187	0.09–0.28		21
35–44	0.287	0.23–0.34		33	0.365	0.27–0.46		44
45–54	0.343	0.29–0.40		41	0.416	0.33–0.51		52
55+ years	0.487	0.43–0.54		63	0.476	0.38–0.57		61
Model 2: Model 1 additionally adjusted for injury severity (hospital and medical services within first 30 days)								
15–24	Ref.			Ref.	Ref.			Ref.
25–34	0.165	0.11–0.22	−1	18	0.178	0.08–0.27	−5	19
35–44	0.282	0.23–0.34	−2	33	0.354	0.26–0.45	−3	43
45–54	0.340	0.29–0.39	−1	40	0.406	0.32–0.49	−2	50
55+ years	0.486	0.43–0.54	0	63	0.471	0.38–0.57	−1	60
Model 3: Model 2 additionally adjusted for injury type and days between affliction and incapacity date[d]								
15–24	Ref.			Ref.	Ref.			Ref.
25–34	0.108	0.05–0.16	−36	11	0.160	0.06–0.26	−14	17
35–44	0.208	0.15–0.26	−28	23	0.312	0.22–0.40	−15	37
45–54	0.257	0.20–0.31	−25	29	0.349	0.26–0.44	−16	42
55+ years	0.410	0.35–0.47	−16	51	0.414	0.32–0.51	−13	51

WorkSafe Victoria claimants with injury dates between 2005 and 2011. Stratified by gender (n = 54 607). CI, confidence interval.
[a]Change in beta estimate from given model compared with model adjusted for covariates only. Estimated by taking the difference in coefficients across nested models (Model 2 versus Model 1 and Model 3 versus Model 1) divided by the coefficient in Model 1.
[b]Relative increase in the geometric mean of days of wage replacement for each age group in comparison to the reference age category. Estimated by taking the exponent of the coefficient (originally in the log-transformed scale) and subtracting '1'.
[c]Estimates adjusted for previous claim, employment status, employer size, industry, occupational strength requirements and year of injury.
[d]Includes variables describing type of injury and body part injured.

Our results should be interpreted given the following strengths and limitations. The use of existing workers' compensation data, while readily available and cost-effective, may not provide a sample that can be generalized to all work-related injuries given that certain factors (such as age, gender or workplace size) have been associated with not filing for compensation after sustaining an eligible injury [29,30]. In addition, we recognize that hospitalizations and health care expenditures, albeit captured in the first 30 days post-injury, are imperfect measures of severity [19] and that the potential remains for misclassification or residual differences in underlying severity. However, in the absence of a validated alternative to the capture of severity in administrative data [19,20], we have used the best measures available in our data sources. Future research might examine the relationship across granular injury types or measures of severity derived from detailed diagnosis codes or linked data sources [19,20].

Given the persistent relationship between older age and longer absence duration after accounting for severity and the type of injury sustained, our results pose interesting questions as to what factors may be responsible for age differences in days of compensation. Although previous studies have found that increased injury severity was one of the important drivers of age differences in RTW outcomes [15], the reporting features of the compensation system in Victoria resulted in a population of claimants where older age was not associated with greater severity. Moreover, while adjustment for differences in injury type resulted in the largest attenuation of age effects, workers aged 55 or over still had ~50% greater mean days compared with the youngest age group. Taken together, the above findings suggest that injury-related characteristics may not be the primary drivers of age differences in wage replacement duration and that general (rather than injury-specific) approaches to reducing age inequalities in wage replacement duration may be warranted. Further research is needed to better elucidate the drivers of age differences in compensation in the Victorian context. Given the hypothesized importance of psychosocial factors (e.g. self-efficacy to RTW) and worker interactions (e.g. physician–worker interactions, workplace offers of modified duties) in the RTW and recovery process [27,28], future studies could examine whether age-related differences in these other factors explain the observed relationship between age and disability duration.

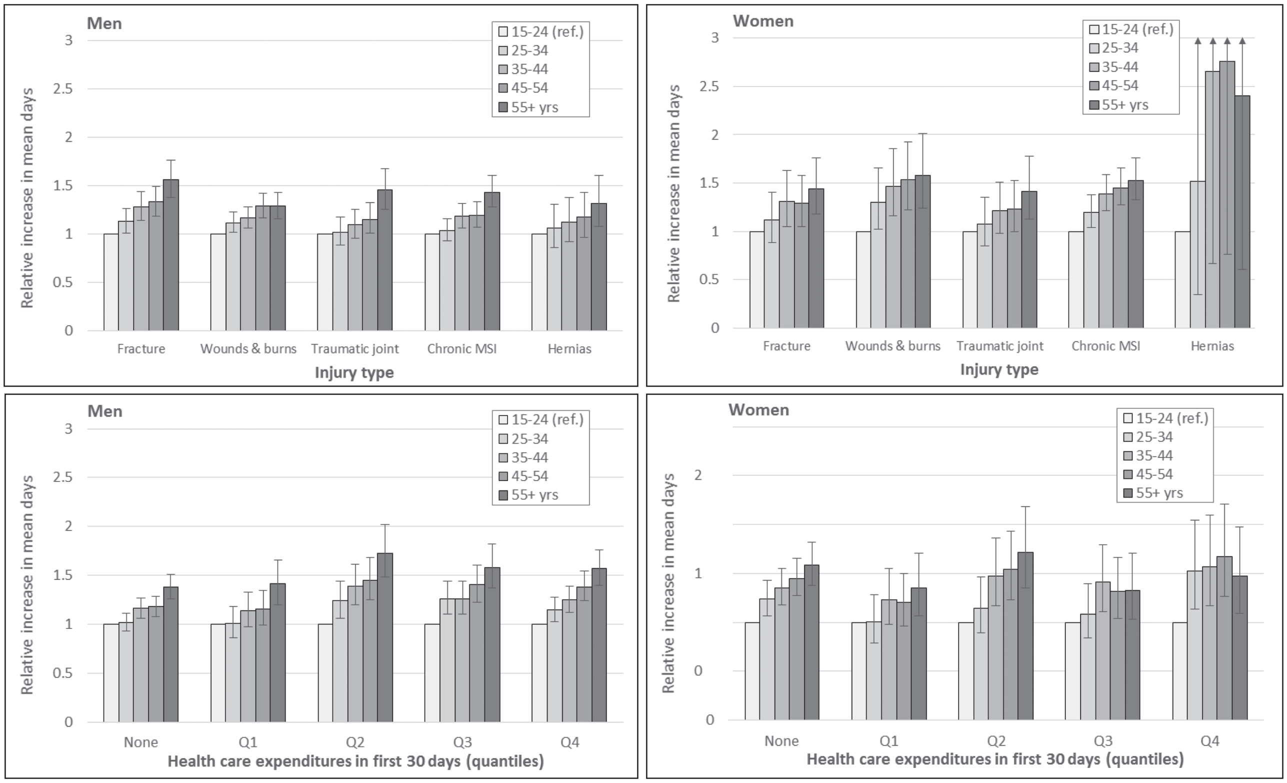

Figure 2. Relative increase in mean days of wage replacement (with 95% confidence intervals) across age groups, by type of injury (top two panels) and health care expenditures (bottom two panels). WorkSafe Victoria claimants with injury dates between 2005 and 2011. Stratified by gender. (i) Relative increase in the geometric mean of days of wage replacement for each age group in comparison to the reference age category (15–24 years). Estimated by taking the exponent of the coefficient (originally in the log-transformed scale) and subtracting '1'. (ii) Estimates are adjusted for previous claim, employment status, employer size, industry, occupational strength requirements, year of injury, body part injured and days between affliction and incapacity date. (iii) Age * injury cross-product regression coefficients (to assess the presence of statistical interaction between age and type of injury/severity) were not statistically significant at the P <0.05 level. (iv) Traumatic joint: traumatic injuries to joints, ligaments or tendons. (v) Figures exclude the small proportion of claims with intracranial (0.6%) and other (2.6%) injury types.

Key points

- In this study, age differences in wage replacement duration persisted after accounting for a variety of injury-related characteristics.
- The relationship between age and wage replacement duration was similar across different types of injuries and levels of severity, suggesting that there was no effect-measure modification of the age estimates by injury-related characteristics.
- Injury-related characteristics may not be the primary drivers of age differences in wage replacement duration, and thus general rather than injury-specific prevention approaches to reducing age-inequalities in wage replacement duration may be warranted.

Acknowledgements

We thank the Institute for Safety, Compensation and Recovery Research for providing access to WorkSafe Victoria's compensation claims data through the Compensation Research Database.

Funding

This work was supported by a Discovery Early Career Researcher Award from the Australian Research Council (to P.M.S.).

Conflicts of interest

None declared.

References

1. Dixon S. *Implications of Population Ageing for the Labour Market*. London, UK: Office for National Statistics, 2003.
2. Australian Bureau of Statistics. *Older People and the Labour Market* [Internet]. ABS Cat. No. 4102.0. 2010. http://www.abs.gov.au (8 November 2016, date last accessed).
3. Statistics Canada. *Aging of the Workforce: Portrait of Canada's Labour Force, National Household Survey, 2011* [Internet]. Cat. No. 99-012-X2011002. 2013. https://www12.statcan.gc.ca (8 November 2016, date last accessed).
4. Office for National Statistics. *Table A05: Labour Market by Age Group: People by Economic Activity and Age (Seasonally Adjusted)* [Internet]. 2016. https://www.ons.gov.uk (8 November 2016, date last accessed).

5. Australian Bureau of Statistics. *Work-Related Injuries, Australia* [Internet]. ABS Cat. No. 6324.0. 2010. http://www.abs.gov.au (8 November 2016, date last accessed).
6. Berecki-Gisolf J, Clay FJ, Collie A, McClure RJ. Predictors of sustained return to work after work-related injury or disease: insights from workers' compensation claims records. *J Occup Rehabil* 2012;**22:**283–291.
7. Smith P, Bielecky A, Ibrahim S *et al*. Impact of pre-existing chronic conditions on age differences in sickness absence after a musculoskeletal work injury: a path analysis approach. *Scand J Work Environ Health* 2014;**40:**167–175.
8. Steenstra IA, Verbeek JH, Heymans MW, Bongers PM. Prognostic factors for duration of sick leave in patients sick listed with acute low back pain: a systematic review of the literature. *Occup Environ Med* 2005;**62:**851–860.
9. Collie A, Lane TJ, Hassani-Mahmooei B, Thompson J, McLeod C. Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems. *BMJ Open* 2016;**6:**e010910.
10. Cheadle A, Franklin G, Wolfhagen C *et al*. Factors influencing the duration of work-related disability: a population-based study of Washington State workers' compensation. *Am J Public Health* 1994;**84:**190–196.
11. Murray E, Franche RL, Ibrahim S *et al*. Pain-related work interference is a key factor in a worker/workplace model of work absence duration due to musculoskeletal conditions in Canadian nurses. *J Occup Rehabil* 2013;**23:**585–596.
12. Fan J, McLeod CB, Koehoorn M. Descriptive epidemiology of serious work-related injuries in British Columbia, Canada. *PLoS One* 2012;**7:**e38750.
13. Algarni FS, Gross DP, Senthilselvan A, Battié MC. Ageing workers with work-related musculoskeletal injuries. *Occup Med (Lond)* 2015;**65:**229–237.
14. Smith P, Bielecky A, Mustard C *et al*. The relationship between age and work injury in British Columbia: examining differences across time and nature of injury. *J Occup Health* 2013;**55:**98–107.
15. Pransky GS, Benjamin KL, Savageau JA, Currivan D, Fletcher K. Outcomes in work-related injuries: a comparison of older and younger workers. *Am J Ind Med* 2005;**47:**104–112.
16. Safe Work Australia. *Comparison of Workers' Compensation Arrangements in Australia and New Zealand, 2013–2014* [Internet]. Canberra, Australia: Safe Work Australia, 2015. http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/publication (8 November 2016, date last accessed).
17. Crawford JO. Older workers—workplace health evidence-based practice? *Occup Med (Lond)* 2016;**66:**424–425.
18. Australian Bureau of Statistics. *Consumer Price Index: Concepts, Sources and Methods* [Internet]. ABS Cat. No. 6461.0. 2011. http://www.abs.gov.au (8 November 2016, date last accessed).
19. Sears JM, Bowman SM, Rotert M, Hogg-Johnson S. A new method to classify injury severity by diagnosis: validation using workers' compensation and trauma registry data. *J Occup Rehabil* 2015;**25:**742–751.
20. National Center for Health Statistics (NCHS) Expert Group on Injury Severity Measurement. *Discussion Document on Injury Severity Measurement in Administrative Datasets*. Hyattsville, MD: CDC, 2004. http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf (8 November 2016, date last accessed).
21. Australian Safety and Compensation Council. *Type of Occurrence Classification System (TOOCS)*. Canberra, Australia: Australian Safety and Compensation Council, 2008.
22. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986;**51:**1173–1182.
23. VanderWeele TJ. Unmeasured confounding and hazard scales: sensitivity analysis for total, direct, and indirect effects. *Eur J Epidemiol* 2013;**28:**113–117.
24. Halvorsen R, Palmquist R. The interpretation of dummy variables in semilogarithmic equations. *Am Econ Rev* 1980;**70:**474–475.
25. Messing K, Punnett L, Bond M *et al*. Be the fairest of them all: challenges and recommendations for the treatment of gender in occupational health research. *Am J Ind Med* 2003;**43:**618–629.
26. Smith PM, Black O, Keegel T, Collie A. Are the predictors of work absence following a work-related injury similar for musculoskeletal and mental health claims? *J Occup Rehabil* 2014;**24:**79–88.
27. Franche RL, Cullen K, Clarke J, Irvin E, Sinclair S, Frank J; Institute for Work & Health (IWH) Workplace-Based RTW Intervention Literature Review Research Team. Workplace-based return-to-work interventions: a systematic review of the quantitative literature. *J Occup Rehabil* 2005;**15:**607–631.
28. Iles RA, Davidson M, Taylor NF. Psychosocial predictors of failure to return to work in non-chronic non-specific low back pain: a systematic review. *Occup Environ Med* 2008;**65:**507–517.
29. Sears JM, Bowman SM, Adams D, Silverstein BA. Who pays for work-related traumatic injuries? Payer distribution in Washington State by ethnicity, injury severity, and year (1998–2008). *Am J Ind Med* 2013;**56:**742–754.
30. Smith PM, Kosny AA, Mustard CA. Differences in access to wage replacement benefits for absences due to work-related injury or illness in Canada. *Am J Ind Med* 2009;**52:**341–349.