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Comparison of Musculoskeletal Disorder Health Claims Between Construction Floor Layers and a General Working Population

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Abstract

Objectives—Compare rates of medical insurance claims for musculoskeletal disorders (MSD) between workers in a construction trade and a general worker population to determine if higher physical exposures in construction lead to higher rates of claims on personal medical insurance.

Methods—Health insurance claims between 2006 and 2010 from floor layers were frequency matched by age, gender, eligibility time, and geographic location to claims from insured workers in general industry obtained from MarketScan. We extracted MSD claims and dates of service from six regions of the body: neck, low back, knee, lower extremity, shoulder, and distal arm, and evaluated differences in claim rates.

Results—Fifty-one percent of floor layers (n=1,475) experienced musculoskeletal claims compared to 39% of MarketScan members (p<0.001). Claim rates were higher for floor layers across all body regions with nearly double the rate ratios for the knee and neck regions (RR: 2.10 and 2.07). The excess risk was greatest for the neck and low back regions; younger workers had disproportionately higher rates in the knee, neck, low back, and distal arm. A larger proportion of floor layers (22%) filed MSD claims in more than one body region compared to general workers (10%; p<0.001).

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CONTRIBUTORS

All coauthors participated in the planning of the research, the interpretation of the data analysis, and reviewed and edited the final manuscript. Data analysis was conducted by Dan Ryan (Floor layers data) and Harini Subramaniam (MarketScan data).

COMPETING INTERESTS

No authors in this study have actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three (3) years of beginning the work submitted that could inappropriately influence this work.

Conclusions—Floor layers have markedly higher rates of MSD claims compared to a general worker population, suggesting shifting of medical costs for work-related MSD to personal health insurance. The occurrence of disorders in multiple body regions and among the youngest workers highlights the need for improved work methods and tools for construction workers.

Keywords

Musculoskeletal Diseases; Claims analysis; Construction trades; Occupational exposure

INTRODUCTION

Musculoskeletal disorders (MSDs) are a leading work-related health issue among construction workers,[1] but determining the true burden of morbidity associated with work activities is difficult within current surveillance and medical insurance systems. In the United States, work-related injuries are covered by employers' Workers' Compensation (WC) insurance plans, while non-work conditions are covered under personal insurance plans, which may be provided by an employer, a union, or government. There is growing evidence that work-related injuries and illnesses are under-reported due to both employer and employee factors;[2-4] studies have shown cost-shifting of work-related claims to private or public health insurance programs.[5, 6] Some construction workers have resorted to using the emergency room to receive medical treatment for work-related events that are never filed under WC insurance.[7, 8] This is in part due to the lack of training by emergency room and family practice physicians to recognize work related risk and causal attribution to work. [7] Shifting of claims from work-related coverage to other sources places the burden of disease on workers and their families and shifts attention to managing the disease rather than focusing prevention efforts on work-related causes.

The WC system is best suited to handling claims for acute injury; in most WC systems, it is more difficult to establish work-relatedness and claim coverage for medical treatment of chronic musculoskeletal disorders. Chronic MSDs develop slowly over months to years before the disorder is evident and a diagnosis is confirmed.[9,10] Claims for MSDs may be denied by the WC system in some states if work-related events or activities are not the "prevailing factor" in causing the injury, or if the cause cannot be ascribed solely to the current employer.[11] In addition to the difficulty of getting workers compensation coverage, there are other disincentives for filing WC by workers including fear of termination, jeopardizing rewards from zero injury programs, and fear of increasing workers' compensation costs for the company.[12] Many construction workers change employers frequently or work as independent contractors[13] so intermittent coverage or lack of WC coverage may preclude reporting. Often workers with these conditions seek medical care through personal health coverage systems rather than through workers' compensation.[14-16]

Many construction workers are not eligible for personal health coverage. When insurance coverage was examined by occupation, construction workers had the second lowest rate of health insurance, second only to agricultural workers; only 68% had coverage.[17] Coverage levels were much higher among union workers (81%) compared to their non-union

counterparts (34%).[17] Construction trade union members are eligible for health coverage through joint labor-management trust funds, obtained through the collective bargaining agreement process, if they meet the required number of work hours. This insurance is portable across employers that contribute to the fund. Without such a fund that allows a worker to carry insurance from one employer to another, the short term employment characteristic of the industry discourages employers from providing coverage.

Under-reporting of work-related claims and shifting of claims from the WC system to the private health system will obscure an association between WC claims and physical work exposures.[13, 18, 19]. This study described the distributions and compared rates of personal (not workers' compensation) health insurance claims for MSDs and compared rates seen between union floor layers and workers in general industry. We hypothesized that the injury rates of musculoskeletal disorders would be higher among construction floor layers than among workers from a general working population after adjusting for age, gender, and time eligible to file claims.

MATERIALS AND METHODS

Data Sources

Floor Layers Health Claims Data—We obtained health claims data of covered floor layer union members from the Carpenters Health and Welfare Trust Fund (CHWTF) in Missouri. The Fund manages the health coverage, pension, and disability benefits for active union workers (carpenters, floor layers, and other union groups in the local area) and their dependents. Health coverage eligibility requires active union membership status and initial accrual of 500 work hours in a 6-month period, with additional accrual of 300 work hours per quarter or 1200 hours per year for ongoing eligibility. Members who do not meet the required number of work hours in a given period are given the option to obtain temporary group health coverage through self-pay or COBRA (Consolidated Omnibus Budget Reconciliation Act) options. We restricted the health claims dataset to actively working union members who had a minimum age of 18 years, logged at least 80% of their total work hours with a floor laying contractor, and were covered under the union's health insurance plan and thus eligible to file a claim between January 2006 and December 2010. We selected only the period of continuous eligibility for each floor layer member obtained through either active work hours or temporary group health coverage for the final analytic sample . The sample was restricted to male workers since fewer than 1% were female.

General Population Health Claims Data—The general population dataset came from the *Truven Health Analytics MarketScan® Commercial Claims and Encounters Database*, a data warehouse of individual level healthcare claims from large employers and health plans. [20] The MarketScan (MS) database is the largest collection of employer-based health records in the U.S., with data on over 88 million unique workers from 2006-2010. The database provides longitudinal tracking of persons through employer-sponsored health plans and captures care from hospital, outpatient, and pharmacy records.

We restricted the data to active working males with a minimum age of 18 years at the start of their enrollment period, employed within the 12 states of the North Central geographic

region of the U.S., and enrolled in a fee-for-service health plan. In order to create a final sample with the same age and eligibility profile as the floor layers dataset, we stratified the actively working (full- or part-time), primary insured adult males in the 12 states into strata based on one-year periods of eligibility, and then sampled within the five strata to frequency match the distribution of age within categories (18-24, 25-34, 35-44, 45-54, and 55+ years) to the floor layers population. This process resulted in a randomly selected age and eligibility matched sample from the general population data, with a 10:1 ratio of workers in general industry to floor layers in the final dataset. From the floor layer and sampled MS dataset, we extracted claims for inpatient and outpatient services and primary or secondary International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis codes. This study was approved by the Institutional Review Board of Washington University School of Medicine.

ICD-9 codes and body region categories—We extracted ICD-9-CM diagnosis codes for MSDs and the dates of service from claim records. The ICD-9-CM list of diagnoses of interest was compiled from codes used in several previous studies [21-27] including 354.XX (carpal tunnel syndrome and other nerves), 715.XX (osteoarthrosis), 717.XX (knee meniscus), 718.87 and 719.47 (ankle pain), 721.XX, 722.XX, 723.XX, 724.XX (cervical, thoracic, lumbar problems), 726.XX, 727.XX, 728.XX (injuries to the shoulder, elbow, wrist, hand, digits, knee and ankle), 739.XX (back pain), 836.XX (knee), 840.XX, 841.XX, 842.XX, 844.XX, 846.XX, 847.XX (sprain and strain). To reduce the number of categories in our analysis, we combined ICD-9-CM codes by the primary body region and created six categories: neck, shoulder/upper arm, distal arm (includes elbow to fingers), low back, knee, and other lower extremity (including hip, ankle and foot). Diagnosis codes that did not specify a body region were excluded.

Data analysis—We created the two datasets as described above. To determine the rate of MSD claims, we counted the number of subjects that filed at least one ICD-9 code for each body part and censored the time at risk on the date of the first claim in the period. We computed the annual rates for each year and overall rate for the entire period of 2006-2010. We computed the proportion of insured workers with one or more MSD claims per body part as well as the incident rates calculated as the number of subjects with MSD claims by the total months each subject was eligible to file a claim. Subjects with an MSD were considered eligible until their first MSD claim date; those without MSD claims were considered eligible for their total contribution time. We compared the incident rates based on 10 person-years of eligibility of the floor layers and MS groups, testing for statistical difference between populations using a z-test ratio of independent proportions. The claims for each population were stratified by age to determine if MSDs disproportionately affected particular age groups. We explored whether workers filed claims for more than one body region including the low back, neck, and knee during the period and whether the number of workers with claims differed between the work groups. SAS Software version 9.1[28] was used for all analyses.

RESULTS

There were 1,475 male floor layers (FL) and 14,750 male MS members in the respective datasets, frequency matched by 1-year categories of health insurance enrollment and age category. Table 1 shows the age distribution of floor layers at the beginning of the study period and the duration of continuous eligibility. The final cohorts were nearly identical for age (FL: mean 35.2 years (SD 10.9); MS mean 35.1 years (SD 10.7); p=0.77) and similar for insurance eligibility distribution (FL: mean 40.7 months (SD 20.5); MS: mean 41.3 months (SD 19.9); p=0.28). A larger proportion of the floor layers experienced MSD diagnoses for one or more body parts (51.2%) compared to the MS group (38.5%) (Z=9.47, p<0.001).

The proportion of workers with at least one claim for an MSD during the study was significantly higher among the floor layers compared to the MS group as shown in Table 2. The incident claim rates, calculated as the number of subjects with MSD claims over their eligibility time at risk, showed rates were higher for each body region among the floor layers compared to the MS group. The rate ratios were more than double for the floor layers in the knee and neck regions compared to the MS group.

Stratifying the data by age group, the rate ratios in Table 3 shows that floor layers had consistently higher rates of MSD claims than the MS cohort across many age categories for most body parts. In general, the largest rate ratios were found in the youngest group (18-24) of floor layers for the knee, neck, low back, and distal arm regions, with decreasing ratios relative to MS workers in the middle age groups but not in the oldest age group. The risk differences were largest for the low back and neck regions.

Claims for multiple body regions were more common among the floor layers. Table 4 shows the proportion of workers with claims for more than one body region including low back, neck, and knee. A significantly larger proportion of the floor layers (22.4%) had claims filed for more than one of these three body regions compared to the MS cohort of workers (9.6%; z-test p <0.001).

DISCUSSION

Our study showed that the rates of individuals with one or more health insurance claims for chronic MSDs among floor layers were nearly double the rates for a general population of male workers in the Midwest. Although the rates among floor layers were higher for all body regions, the largest proportional differences were for claims of the knee and neck, and these claims were proportionally higher among the youngest floor layers relative to the same age group of workers in general industry. The large differences in MSD claims for this active working group of floor layers, and the fact that these differences were largest among young workers, suggests that workers are using their personal health insurance for treatment of work-related conditions. These data point to two main concerns: that floor layers have more chronic MSDs than the workforce in general, and that payment for medical care related to work activities is being shifted onto the worker's personal health insurance rather than being paid by the employer through the WC system.

Most past studies that report on floor layers have demonstrated high rates for knee disorders[29] including knee osteoarthritis, meniscal tears, and knee bursitis.[21, 30-33] Studies using self-reported symptoms among construction workers have shown greater physical complaints in many body regions when compared to foremen and to non-construction workers [34], but there has been little investigation of medical diagnoses in regions of the body other than the knee among floor layers,[35] nor of the occurrence of diagnoses in multiple body regions. The current study showed that floor layers saw a physician and received musculoskeletal diagnoses across many body regions; floor layers suffer from high rates of low back, neck, shoulder, and distal arm disorders in addition to knee conditions. Importantly, almost one-quarter of floor layers received medical treatment for disorders in more than one body region within the relatively short period of time of this 5-year investigation.

All construction work including laying floors is physically demanding. Past literature highlights the occupational physical risks of work tasks among floor layers and supports a causative relationship between work activities and health claims of the knee.[36-40] A few recent studies on floor layers have found high work related physical exposures for other body parts including the low back, neck, and upper extremities[35, 41 42] in addition to the knee. The all-fours position (kneeling with the hands on the floor) is commonly used in laying floors since most of the work is performed at the floor level. Workers use forceful and repetitive motions of the arms and hands to spread adhesive, lay ceramic tiles, and nail boards while kneeling on the floor. This combination of exposures occurring for long periods of time during the work day may increase the risk of injury to multiple body regions, as was found in the current study. NIOSH has published recommendations to prevent or reduce knee disorders among carpet layers,[43] including knee pads and use of a power kicker. In addition to these recommendations for knee protection, NIOSH has other recommendations to prevent back, shoulder and other MSDs among construction workers.[44] Our findings support the need for continued attention to prevention of over-exertion injuries, given the high prevalence of potentially work-related MSDs seen in medical claims data.

Another key finding of this study was the comparatively large MSD morbidity seen among the youngest floor laying work group. Even though young workers possess good physical strength and flexibility, they experience MSDs when their work tasks exceed their physical capabilities. The high physical demands in many construction jobs have been reported to lead to greater functional limitations and early disability among construction workers.[45-48] Arndt and colleagues[49] showed that German construction workers were more than twice as likely to become disabled due to musculoskeletal disease compared to the general workforce. High rates of MSD-related disability and early departure from the productive workforce highlight the need for interventions to be applied to all level of workers within the construction industry.

Even though this study was conducted in the U.S. and therefore influenced by the policy and regulations of the two-part insurance system, the concern for cost-shifting from employer to employee and their families is not limited to the U.S. Under-recognition of occupational diseases can occur in many kinds of health systems, shifting responsibility for occupational

injury and disease to the worker. LaDou[50] reports that under-recognition of occupational diseases is common to all EU countries, with a transfer of resources to the employer's benefit, with much of the cost burden being shared between injured workers and general health budgets through social security coverage of diseases, disability, and unemployment, In addition use of personal or social health systems rather than ones created to compensate occupational injury delays efforts and limits resources for reducing the high physical demands of the job.

The primary limitation in this study was the comparison of claims derived from separate insurance programs. Age and eligibility in a health plan may affect an individual's ability to file a health plan claim for chronic MSDs so we selected data from the MS database by frequency matching on age group, gender, geographical location, and duration of health insurance eligibility, to allow for the most valid comparisons between medical claims. Since we used an existing working population, we were unable to account for a healthy worker effect; given that floor layers had higher physical demands than the general working population, it is more likely that the floor layers would have differentially left employment due to symptoms or musculoskeletal disorders; if this were the case it would result in an under-estimate of the rate of MSDs. While it is possible that some of the observed differences could be related to differential utilization of health services, differences in insurance administration, or assignment of diagnostic codes by providers, we believe it is unlikely that the size of the differences in MSD rates between the floor layers and the general worker population represented in MS were due only to differences in insurance plans. We also did not account for other potential differences between the work groups including education and income, although past literature has shown few associations with musculoskeletal disorders except with the lowest income and education group.[51]

The strength of this study was the availability of health claims for a large group of floor layers that spanned the full working age. We were able to frequency match on important demographic characteristics of a general population of workers and describe differences in proportions of individuals with claims for musculoskeletal injuries. This study provided the opportunity to explore musculoskeletal claims from all regions of the body for these two work groups, and demonstrated important differences in claim rates for medical treatment of MSDs.

CONCLUSIONS

Construction floor layers seek treatment for potentially work-related conditions through their personal health program as shown by the excessively high rate ratios of claims for MSDs when compared to general working populations. Shifting claims to personal health records shifts the costs from employer to worker and lessens attention toward developing better work practices and improved tools and equipment. The observation that the youngest workers are seeking medical treatment, often for MSDs in multiple body regions, indicates that these workers are at increased risk of disabling MSDs starting early in their careers. There is an urgent need for developing better work methods for floor layers and other construction workers.

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WHAT THIS PAPER ADDS

- Musculoskeletal disorders are common among construction floor layers yet several studies suggest there is a shift of work-related health claims from workers' compensation insurance to personal health insurance.
- Shifting of claims to personal health insurance places the burden of disease on workers and their families and shifts attention to managing disease rather than prevention efforts of work-related causes.
- In this study, construction floor layers showed rates of personal health claims for chronic musculoskeletal disorders were nearly double the rates for a general population of workers.
- Under-recognition of occupational diseases created by policies and regulations delays efforts toward prevention and limits resources for reducing high physical demands of a job.

Table 1

Distribution of age and eligibility among floor layer sample (n=1475)

	n	%
Age (years)		
18-24	316	21.4
25-34	475	32.2
35-44	379	25.7
45-54	233	15.8
55+	72	4.9
Eligible Health Insurance Cove rage (months)		
1-12	227	15.4
13-24	172	11.7
25-36	181	12.3
37-48	176	11.9
49-60	719	11.9

Table 2

Proportion of individuals and incidence of claims per 10 person-years of eligibility stratified by body part between 2006-2010

	Floor layers (n=1,475)			MarketScan (n=14,750)					
	n (%)	Eligible Months	Incidence (95% CI)	n (%)	Eligible Months	Incidence (95% CI)	p-value*	Rate Ratio (95% CI) (FL/MS)	Risk Difference
Knee	164 (11.1)	55630	0.35 (0.30, 0.41)	843 (5.7)	600760	0.17 (0.16, 0.18)	<0.001	2.10 (1.78, 2.48)	0.18
Neck	346 (23.5)	50057	0.83 (0.74, 0.92)	1908 (12.9)	570015	0.40 (0.38, 0.42)	<0.001	2.07 (1.84, 2.32)	0.43
Low Back	545 (36.9)	43551	1.50 (1.38, 1.63)	3410 (23.1)	525390	0.78 (0.75, 0.80)	<0.001	1.93 (1.76, 2.11)	0.72
Distal Arm	135 (9.2)	56636	0.29 (0.24, 0.33)	906 (6.1)	598784	0.18 (0.17, 0.19)	<0.001	1.58 (1.32, 1.89)	0.11
Shoulder	122 (8.3)	57004	0.26 (0.21, 0.30)	852 (5.8)	600593	0.17 (0.16, 0.18)	<0.001	1.51 (1.25, 1.82)	0.09
Other LE	117 (7.9)	56978	0.25 (0.20, 0.29)	1064 (7.2)	595747	0.21 (0.20, 0.23)	0.311	1.15 (0.95, 1.39)	0.04
Any Claim	755 (51.2)	36169	2.50 (2.33, 2.68)	5684 (38.5)	450805	1.51 (1.47, 1.55)	<0.001	1.66 (1.53, 1.79)	0.99

Note: incidence = number of individuals with MSD claims per 10 person-years of eligibility during the period; Rate ratio: incidence of floor layers/incidence of MarketScan people. Risk Difference: the difference between the incidence of floor layers to the incidence of MarketScan people.

* computed z-ratio tests for two independent proportions

Table 3

Incidence of claims per 10 person-years of eligibility by body part and age group over the period between 2006-2010.

	Floor layers (n=1,475)			MarketScan (n=14,750)				Risk Difference
	n (%)	Eligible Months	Incidence (95% CI)	n (%)	Eligible Months	Incidence (95% CI)	Rate Ratio (95% CI) (FL/MS)	
Knee								
18-24	21 (6.6)	9224	0.27 (0.16, 0.39)	98 (3.1)	127456	0.09 (0.07, 0.11)	2.96 (1.85, 4.74)*	0.18
25-34	45 (9.5)	17123	0.32 (0.22, 0.41)	224 (4.7)	194272	0.14 (0.12, 0.16)	2.28 (1.65, 3.14)*	0.18
35-44	46 (12.1)	16013	0.34 (0.25, 0.44)	228 (6.0)	156098	0.18 (0.15, 0.20)	1.97 (1.43, 2.70)*	0.16
45-54	42 (18.0)	10065	0.50 (0.35, 0.65)	217 (9.3)	94339	0.28 (0.24, 0.31)	1.81 (1.30, 2.52)*	0.22
55+	10 (13.9)	3205	0.37 (0.14, 0.61)	76 (10.6)	28595	0.32 (0.25, 0.39)	1.17 (0.61, 2.27)	0.05
Neck								
18-24	48 (15.2)	8578	0.67 (0.48, 0.86)	265 (8.4)	123134	0.26 (0.23, 0.29)	2.60 (1.91, 3.54)*	0.41
25-34	116 (24.0)	15431	0.90 (0.74, 1.07)	632 (13.3)	182157	0.42 (0.38, 0.45)	2.17 (1.78, 2.64)*	0.48
35-44	104 (27.4)	13905	0.90 (0.73, 1.07)	563 (14.9)	146158	0.46 (0.42, 0.50)	1.94 (1.58, 2.39)*	0.44
45-54	59 (25.3)	9245	0.77 (0.57, 0.96)	354 (15.2)	90522	0.47 (0.42, 0.52)	1.63 (1.24, 2.15)*	0.30
55+	19 (26.4)	2898	0.79 (0.43, 1.14)	94 (13.1)	28044	0.40 (0.32, 0.48)	1.97 (1.19, 3.20)*	0.39
Low Back								
18-24	78 (24.7)	7652	1.22 (0.95, 1.49)	530 (16.8)	115762	0.55 (0.50, 0.60)	2.23 (1.76, 2.83)*	0.67
25-34	175 (36.8)	13722	1.53 (1.30, 1.76)	1039 (21.9)	170258	0.73 (0.69, 0.78)	2.09 (1.78, 2.45)*	0.80
35-44	155 (40.9)	12015	1.55 (1.30, 1.79)	997 (26.3)	132873	0.90 (0.84, 0.96)	1.72 (1.45, 2.04)*	0.65
45-54	98 (42.1)	8044	1.46 (1.17, 1.75)	657 (28.2)	81604	0.97 (0.89, 1.04)	1.51 (1.22, 1.87)*	0.49
55+	39 (54.2)	2118	2.21 (1.52, 2.90)	187 (26.0)	24893	0.90 (0.77, 1.03)	2.45 (1.74, 3.46)*	1.31
Distal Arm								
18-24	16 (5.1)	9326	0.21 (0.10, 0.31)	102 (3.2)	127268	0.10 (0.08, 0.11)	2.14 (1.26, 3.63)*	0.11
25-34	39 (8.2)	17462	0.27 (0.18, 0.35)	246 (5.2)	193359	0.15 (0.13, 0.17)	1.76 (1.25, 2.46)*	0.12
35-44	41 (10.8)	16111	0.31 (0.21, 0.40)	285 (7.5)	154330	0.22 (0.20, 0.25)	1.38 (0.99, 1.91)	0.09
45-54	31 (13.3)	10421	0.36 (0.23, 0.48)	215 (9.2)	94790	0.27 (0.24, 0.31)	1.31 (0.90, 1.91)	0.09

	Floor layers (n=1,475)			MarketScan (n=14,750)				Risk Difference
	n (%)	Eligible Months	Incidence (95% CI)	n (%)	Eligible Months	Incidence (95% CI)	Rate Ratio (95% CI) (FL/MS)	
55+	8 (11.1)	3316	0.29 (0.09, 0.49)	58 (8.1)	29037	0.24 (0.18, 0.30)	1.21 (0.58, 2.53)	0.05
Shoulder								
18-24	5 (1.6)	9601	0.06 (0.01, 0.12)	121 (3.8)	127254	0.11 (0.09, 0.13)	0.55 (0.22, 1.34)	−0.05
25-34	39 (8.2)	17540	0.27 (0.18, 0.35)	223 (4.7)	194015	0.14 (0.12, 0.16)	1.93 (1.38, 2.72)*	0.13
35-44	39 (10.3)	16323	0.29 (0.20, 0.38)	243 (6.4)	155364	0.19 (0.16, 0.21)	1.53 (1.09, 2.14)*	0.10
45-54	28 (12.0)	10304	0.33 (0.21, 0.45)	205 (8.8)	94787	0.26 (0.22, 0.30)	1.26 (0.85, 1.86)	0.07
55+	11 (15.3)	3236	0.41 (0.17, 0.65)	60 (8.3)	29173	0.25 (0.18, 0.31)	1.65 (0.87, 3.14)	0.16
Other LE								
18-24	12 (3.8)	9343	0.15 (0.07, 0.24)	146 (4.6)	126335	0.14 (0.12, 0.16)	1.11 (0.62, 2.00)	0.01
25-34	25 (5.3)	17731	0.17 (0.10, 0.24)	312 (6.6)	192475	0.19 (0.17, 0.22)	0.87 (0.58, 1.31)	−0.02
35-44	45 (11.9)	16052	0.34 (0.24, 0.43)	308 (8.1)	153891	0.24 (0.21, 0.27)	1.40 (1.02, 1.92)*	0.10
45-54	23 (9.9)	10586	0.26 (0.15, 0.37)	229 (9.8)	94146	0.29 (0.25, 0.33)	0.89 (0.58, 1.37)	−0.03
55+	12 (16.7)	3266	0.44 (0.19, 0.69)	69 (9.6)	28900	0.29 (0.22, 0.35)	1.54 (0.83, 2.84)	0.15
Multiple MSDs								
18-24	62 (19.6)	8393	0.89 (0.67, 1.11)	293 (9.3)	123730	0.28 (0.25, 0.32)	3.12 (2.37, 4.10)*	0.61
25-34	133 (28.0)	15031	1.06 (0.88, 1.24)	682 (14.4)	183317	0.45 (0.41, 0.48)	2.38 (1.98, 2.86)*	0.61
35-44	135 (35.6)	13510	1.20 (1.00, 1.40)	693 (18.3)	144367	0.58 (0.53, 0.62)	2.08 (1.73, 2.50)*	0.62
45-54	82 (35.2)	8773	1.12 (0.88, 1.36)	514 (22.1)	87459	0.71 (0.64, 0.77)	1.59 (1.26, 2.01)*	0.41
55+	29 (40.3)	2667	1.30 (0.83, 1.78)	131 (18.2)	27172	0.58 (0.48, 0.68)	2.26 (1.51, 3.37)*	0.72

Incidence= number of individuals with claims per 10 person-years of eligibility during the period; Rate ratio: incidence of floor layers/ incidence of MarketScan people; Risk Difference: the difference between the incidence of floor layers to the incidence of MarketScan people.

*indicates rate ratios with significant difference between the floor layer rate and MS cohort rate since the lower bound is above 1.0.

Table 4

Proportion of members with claims for one or more body regions of the low back, neck, and/or knee between work groups during the period 2006-2010

	Floor layers (n=1,475) n (%)	MarketScan (n=14,750) n (%)	p-value*
None**	801 (54.3)	10142 (68.8)	<0.001
Low Back	217 (14.7)	2043 (13.9)	0.363
Neck	61 (4.1)	681 (4.6)	0.399
Knee	65 (4.4)	465 (3.2)	0.001
Multiple***	331 (22.4)	1419 (9.6)	<0.001

* using z-ratio test for two independent proportions

** Members with no claims for the low back, neck, or knee

*** Claims for more than one of three body regions, including low back, neck, and/or knee