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Factors Influencing Duration of Exposure with Symptoms and Costs of Occupational Asthma

Running head: Socioecononomic Factors in Occupational Asthma

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Abstract

The most important factor for the prognosis of occupational asthma is the length of exposure with symptoms prior to removal from exposure.

We wanted to identify factors including socioeconomic status that can influence the delay in submitting a claim to a medicolegal agency after the onset of asthmatic symptoms and to confirm that this delay is associated with worse respiratory prognosis and higher direct costs.

This is a cross-sectional study of subjects who claimed compensation for occupational asthma at the Workers' Compensation Board of Quebec. Data were collected at re-evaluation approximately two and a half years after diagnosis. Information on the number of years with symptoms and removal from exposure was obtained from the medicolegal file.

Sixty subjects were included in the study. Being older, having a revenue of >30,000 canadian dollars and having occupational asthma due to high molecular weight agents were all positively associated with the number of years of exposure with symptoms before removal from exposure. Subjects with persistent airway hyperresponsiveness at follow-up had a higher number of years with symptoms. Experiencing symptoms in the workplace for less than one year generated lower direct costs.

These findings might help in surveillance programs that could be preferentially targeted for these subgroups of workers.

Keywords: Costs and Cost Analysis, diagnosis delay, economics, Quebec, Socioeconomic factors

Abbreviations:

CAD: Canadian dollars

HMW: high molecular weight

LMW: low molecular weight

OA: occupational asthma

PC20: concentration of methacholine causing a fall in forced expiratory volume in one second of greater or equal to 20%

YWS: years of exposure with symptoms before removal from exposure

Introduction

The majority of subjects with occupational asthma (OA) continue having symptoms despite leaving the causal workplace and having medication to treat the underlying airway inflammation[1]. The single most important factor that determines the prognosis of OA is the duration of time that an individual is exposed to the offending agent while experiencing symptoms prior to diagnosis and subsequent removal from exposure[2]. Socioeconomic factors are important determinants of health and influence the frequency, severity and progression of most known diseases[3]. In Europe, an individual's low socioeconomic status was shown to be a risk factor for asthma as well as living in an underprivileged area, regardless of the individual's educational level or social class[4]. Work-related asthma is associated with lower educational levels as shown in a population of young adults in Brazil, most likely because those individuals with a shorter period spent at school start working earlier and therefore, experience longer exposure to potentially offending agents at work. Moreover, due to their low educational level, they have limited working options and are prone to work in manual professions with a higher risk of exposure[5].

Besides the obvious physical deterioration in health, having OA has a significant socioeconomic impact on the individuals since between 25-38% of them suffer prolonged work disruption and 42-78% report a loss of income[6]. Compensating for OA generates high costs for the medicolegal agency as reported for Québec/Canada: The median total cost for a case of OA was reported to be 61.3 CAD$\times 10^3$ and was higher for subjects older than 40 years of age, males and those requiring retraining or taking an early retirement[7].

The aim of this study was to identify socioeconomic factors that can influence the delay in submitting a claim to a medicolegal agency with removal from exposure

after the onset of asthmatic symptoms. We wanted to confirm that this delay is associated with worse respiratory prognosis and to examine whether this delay generates higher direct costs when combined with others.

Methods

This is a cross-sectional study investigating subjects who claimed compensation for OA at the Workers' Compensation Board of Quebec between the years 2004 to 2006 and were evaluated for permanent disability indemnity in the Montreal area. All study subjects gave written consent for their participation. The research protocol was approved by the Ethics Committee of our hospital.

Subjects were investigated at the time of re-evaluation by Workers' Compensation Board for permanent disability indemnity and answered a questionnaire on medication, tobacco consumption, type of agent causing the OA, information about the workplace, socio-demographic and -economic outcomes as well as information about the Workers' Compensation Board's Social Rehabilitation Program. The Workers' Compensation Board records were consulted to obtain information concerning costs for compensation for loss of income and compensation for functional impairment. Compensation for loss of income corresponds mainly to compensation for lost salary during the rehabilitation period (up to two years) after a worker is removed from the workplace harbouring the offending work agent. Compensation for functional impairment is allocated at the time of re-evaluation by the Workers' Compensation Board, about two years after diagnosis and after subsequent removal from the workplace and is calculated according to the Workers' Compensation Board Scale for OA.

The number of years of exposure in the workplace with symptoms before removal from exposure (YWS) was determined by consulting the Workers' Compensation Board file. We recorded the time period as noted by the local medical committee in the initial official report.

Skin prick tests were performed and subjects underwent spirometry, methacholine challenge testing and analysis of induced sputum at diagnosis and at re-evaluation.

At diagnosis specific inhalation testing was performed in all study participants and a positive test was a pre-requisite that the diagnosis was assigned. The asthma severity at diagnosis, at re-evaluation and the proportion of permanent disability that was allocated were calculated according to the Quebec Workers' Compensation Board Scale for OA: 0% low severity, 100% Maximum severity)[8]. This scale incorporates three factors in the same way as the one proposed by the American Medical Association[9]: level of bronchial calibre, degree of bronchial responsiveness and need for medication to control asthma[10]. We estimated the change in asthma severity by substracting the score at re-evaluation from that at diagnosis. For some analysis we dichotomized the data by using a cut-off of 18%. This severity reflects mild obstruction (FEV1%predicted 71-85%), mild bronchial hyperresponsiveness (PC20 2-16 $mg*mL^{-1}$) and regular of if needed bronchodilatator use.

Continuous data is reported as a mean ± standard deviation or median and 25 and 75 percentiles. Proportions were compared by using Chi – square or Fisher's Exact Test. Continuous variables were compared by using the Student-t test or Mann-Whitney U Test. We used to calculate Spearman's rho for correlation analysis. After performing univariate analysis, a multiple linear regression with staggered inclusion of predictors was performed to evaluate the effects of sociodemographic (age, sex, immigration status, marital status, education), economic (revenue, children to support) workplace (size of the employing company at diagnosis, duration of work with the current employer) and asthma related (type of agent causing OA according to molecular weight and asthma severity) variables on the YWS. Statistical analysis

was performed by means of a software package (SPSS V16, SPSS Inc, Chicago, USA). We considered a p-value of <0.05 as statistically significant.

A more extensive description of the methods can be found in the online depository.

Results

During the study period, 73 subjects were eligible to participate. We were unable to contact five subjects and eight subjects refused to participate in our study, leaving a participation rate of 82%. Non-participants did not differ significantly from participants regarding sex, age at diagnosis, atopy and smoking status, lung function and hyperreactivity to methacholine, proportion of subjects with OA to LMW and number of years in the workplace with symptoms prior to submitting a claim.

Selected baseline characteristics of participants can be seen in Table 1. Nine (15%) of subjects were born outside of Canada. Agents causing OA identified at diagnosis were: Isocyanates 15, Flour 8, Wood dust 2, Metals 4, Resins and Glues 5, Cereals 2, Animal dander 4, Chemical products 8, Latex 5, Persulfates 1, Other proteins 5 and Unknown 1.

The median time between diagnosis and re-evaluation was 33 months (Q1:30;Q3:51 months). At re-evaluation, 6 (10%) reported still being exposed to the offending agent, but very occasionally and to a significantly lesser extent. The six subjects had left their workplace but continued to work for the same employer in another workshop. They admitted in the questionnaire to have very occasional exposure when passing near their old workplaces. Thirteen (22%) continued to work for the same employer as prior to diagnosis but were no longer exposed at all to the causal agent, 20 (33%) had changed their workplace, 3 (5%) were in training programs for new jobs, 12 (20%) were unemployed and 12 (20%) had taken early retirement. After diagnosis of OA, 2 subjects (3%) received assistance from the Workers' Compensation Board in finding a new job, 9 subjects (15%) underwent a retraining program with studies and 7 (12%), a retraining program without studies whereas 42 (70%) received neither retraining and nor assistance in finding a new job.

Twenty-six subjects (43%) reported having a lower income, 18 subjects (30%) a higher income compared to the income prior to diagnosis and in 16 subjects (27%), the income remained the same. Even after taking into account inflation and calculating predicted income by using the Canadian Consumer Price Index, 44 (73%) were still receiving a lower salary at re-evaluation than predicted and 16 (27%), a higher salary at re-evaluation. Those with a lower salary had a median decrease of 16% (Q1;Q3: 7%;46%) while those with a higher salary had a median increase of 16% (Q1;Q3: 7%;55%).

We determined the impact of different socioeconomic factors on YWS in a univariate analysis (Table 2). YWS was significantly longer for subjects older than 40 years of age who had dependent children, who had a salary of CAD 30,000 or more and who experienced more severe asthma at diagnosis. There was no significant difference in YWS according to immigration status, status of having low income according to the definition adopted by Statistics Canada, company size and labour union affiliation (all $p>0.2$ in univariate analysis, data not shown). We initially performed a multivariate linear regression by including socioeconomic variables, as defined a priori in our research hypotheses (Model 1, Table 3). We then included economic variables (model 2) and asthma related variables (model 3) with a significant relation to YWS in the univariate analysis (Table 2). In the best fitting model, having a revenue of <30,000 CAD was negatively associated to YWS while being older, being sensitized to high molecular weight (HMW) allergens and suffering from greater asthma severity at diagnosis were all positively and with the exception of type of agent independently related to YWS. There was a trend for those having dependent children to have a higher YWS. Subjects who were either without a job or on early retirement tended to have a higher YWS compared to those who were still

employed or in training for a new job (4.2 years (Q1;Q3:0.5;11.9 years) vs. 1.1 years (Q1;Q3:0.1;14.8), p=0.086).

Costs for compensation for loss of income were related to the YWS (r=0.405, p=0.007), asthma severity at diagnosis (r=0.428, p=0.004) and to the proportion of permanent impairment that was allocated by the Workers' Compensation Board (r=0.389, p=0.049). Compensation for functional impairment costs were related to asthma severity at diagnosis (r=0.577, p<0.001) and to the proportion of permanent impairment that was allocated (r=0.728, p<0.001). The total costs were related to YWS (r=0.463, p=0.002, Figure 1), asthma severity at diagnosis (r=0.510, p=0.001) and to the proportion of permanent impairment that was allocated (r=0.503, p=0.009). The distribution of costs according to selected health and socioeconomic factors in addition to the type of rehabilitation program and employment status can be seen in Table 4. Factors like immigration status, dependent children, agent, education, number of years with employer and labour union affiliation did not significantly change compensation for loss of income, compensation for functional impairment or total costs. In the multivariate linear regression analysis, being less than one year exposed with symptoms before removal from exposure was negatively related whereas being older was positively related to compensation for loss of income costs (Table 5, Model 1), but when adding the covariate employment status to the model at re-evaluation, the relation of less than one year exposed with symptoms before removal from exposure became insignificantly related to compensation for loss of income costs (Table 5, Model 2). Less than one year exposed with symptoms before removal from exposure and being older were significantly related to total costs (Table 5, Model 3) in the same manner as for compensation for loss of income and the

relation remained unchanged when adding the covariate employment status to the model at re-evaluation (Table 5, Model 4).

Further results concerning change of functional measurements between diagnosis and re-evaluation can be found in the online depository of this journal.

Discussion

Our study shows that workers who are older, who earn a higher salary and whose asthma is related to HMW allergens, are exposed for a longer time with symptoms prior to removal from exposure. This prolonged exposure is associated with: 1) increased asthma severity at diagnosis and persistent bronchial hyperresponsiveness with the need for increased anti-asthma medication at re-evaluation, more than two and a half years after cessation of exposure; and 2) higher direct costs for the medicolegal compensation agency.

Older age was a significant predictor for a higher YWS. Older aged workers generally earn higher salaries, are more likely to have dependent children and may encounter more problems in finding a new job. These factors may render subjects more reluctant to report to a medicolegal agency. In Belgium, the risk of remaining unemployed or having to change employers was also associated with older age in workers with OA[11]. However, in France, Ameille found the opposite, possibly because retraining programs are not readily offered to young workers affected with OA[12]. We showed that subjects who had dependent children had a significantly higher YWS. These subjects may hesitate to claim compensation because they feared losing not only their job and income, but also their self-esteem and status as a provider in the family. Marabini and co-workers also showed that workers with OA and dependent family members are more likely to continue working[13].

We also found that subjects with an educational profile higher than secondary level tended to have a higher YWS, which is different from results published by other researchers. Low educational level has been identified as a risk factor for work-related asthma in the young population[5], for a delay until a diagnosis of OA was made[14] and as a predictor for unemployment after a diagnosis of OA[11, 12]. In a

multivariate analysis of our *a posteriori* model (Table 3), we showed that education, probably because of its association with income, was no longer significant.

Higher income was associated with a higher YWS. This is contrary to the findings in Ontario/Canada in which the time taken to arrive at a definite diagnosis of OA in workers was longer in subjects with a low household income[14]. This difference might be explained by the fact that the outcome of our study was slightly different. We measured the median exposure time with symptoms before removal from exposure while in the study by Poonai, the mean duration of symptoms was determined before the final clinical diagnosis was made. However, in a later study done by the same researchers lower household income was no more related with time to diagnosis in patients with OA[15]. The time it takes to make a final diagnosis depends on many factors, such as the awareness and the availability of information about OA for workers, employers and physicians as well as access to specialised centres. Other important factors might be the severity of symptoms, the nature and extent of work exposures and the compensation that is offered. We explain the difference in our findings by the fact that the comprehensive system of management and compensation of OA in Québec does not hinder workers with lower income to claim compensation, but rather, allows them to seek help and investigation without significant loss of income and the opportunity to retrain in order to get a job with similar or even higher income after retraining. In contrast, workers with higher income and higher education are more likely hesitant to claim as they have more to lose in terms of income and retraining opportunities. Part time workers may fear job loss or refusal of employment insurance eligibility and workers in good paying jobs face a possible loss in income or social status[16]. OA is a condition which, according to the results of our study, may have more detrimental effects in workers with higher

socioeconomic status, a situation that is the reverse to what is found for most health conditions.

Having OA to HMW agents was predictive for a higher YWS. The risk for severe adult onset asthma was not significantly different for low molecular weight (LMW) compared to HMW allergens[17], but it was shown by some that subjects with sensitization to LMW agents like isocyanates, have better disease outcomes, a shorter latency period and a shorter duration of symptoms before diagnosis[18, 19]. We confirmed that asthma severity was related to the YWS. Most follow-up studies of OA have consistently shown that the duration of exposure with symptoms was the principal determinant for the persistence of asthma after cessation of exposure, as reviewed[20]. However, even after adjusting for asthma severity in our model, socioeconomic factors (income and dependent children) as well as age and the nature of the agent, remained significantly associated with YWS (Table 3), which demonstrate that these factors play a significant role on their own. Past studies failed to demonstrate that subjects with more severe asthma are more likely to be unemployed after diagnosis[11-13]. However, none of these studies investigated the direct costs for the medicolegal agency for compensation of lost income and functional impairment. It has been shown that the severity of OA is significantly correlated with quality of life and psychological indices[21].

In sensitizer-induced asthma, the appearance of respiratory symptoms is often gradual and recall bias, for the time of appearance of symptoms and therefore, the time interval a subject reported to be symptomatic at the workplace, is possible. We tried to minimize this by consulting the most reliable documented source of information, the official Workers' Compensation Board report.

Eligibility for compensation and compensation processes often differ depending on the country, province or region influencing the length of time a subject remains in the workplace with symptoms[8]. The main message of our work is to point out that socioeconomic factors are important in these delays, which in turn influence respiratory outcomes and costs. In the current study, the effect of these socioeconomic factors were targeted, examined and quantified in Quebec/Canada where a broad compensation system is in place. Although it is highly likely that socioeconomic factors also play a role in other parts of the world, their nature and impact would need to be examined in relationship with specific compensation systems in place. We showed that even when compensation systems appear to be effective, not all subjects with a high probability of asthma make the decision to terminate exposure to the causal agent sufficiently rapidly to prevent long-term sequelae[22].

Our study shows that advancing age, having a higher salary and having OA to HMW allergens all seem to predict a prolongation of the interval a subject is symptomatic in the workplace and consequently increase the severity of asthma at diagnosis. These findings might help in surveillance programs by preferentially targeting them for subgroups of workers with these characteristics.

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Table 1: Selected baseline characteristics of participants at diagnosis (n=60)

Sex	
- Male	45 (75%)
- Female	15 (25%)
Age (years)	42.9 ±11.0
Atopy*	42 (70%)
Smoking habit	
- Non-smoker	10 (16%)
- Ex-smoker	25 (42%)
- Smoker	25 (42%)
Duration of exposure to causal agent (years)	10.5 (3.1;22.8)
Years of exposure with symptoms before removal from exposure	1.4 (0.1;7.5)
Married	32 (53%)
Having children to support	40 (67%)
Nature of causal agent	
- High-molecular weight	26 (43%)
- Low-molecular weight	33 (55%)
Salary (<30000 CAD)	24 (40%)
Low income†	9 (15%)
Only primary and secondary level education	33 (55%)
Working for a company with less than 20 employees at diagnosis	20 (33%)
Working ≥5 years for same employer	34 (57%)
Member of a labour union	28 (47%)
Professional group	
- Shopkeepers, craftsmen	23 (38%)
- Professionals, managers, intermediate white collars, office and sales employees	11 (18%)
- Skilled and unskilled workers	26 (43%)

Legend: Data are presented as n (%), age is expressed as mean ± standard deviations; duration of exposure and years of exposure with symptoms before removal from exposure are presented as medians (1.Quartile; 3.Quartile). *: atopy defined by at least one immediate skin reaction to 15 ubiquitous aeroallergens. †:Low income was defined as having an income at diagnosis that was less than 110% of the cut-off value for low income according to the definition adopted by Statistics Canada.

Table 2: Univariate analysis of years of exposure with symptoms before removal from exposure

	YWS	p-value
Sex		0.179
- Male (n=45)	1.8 (0.1;8.3)	
- Female (n=15)	0.7 (0.2;2.7)	
Age		0.008
- >40 years (n=38)	2.4 (0.6;11.9)	
- ≤40 years (n=22)	0.6 (0;2.9)	
Asthma severity#		0.003
- <18% (n=41)	0.1 (0;1.4)	
- ≥18% (n=19)	2.6 (1.0;8.2)	
Marital status		0.112
- Married (n=32)	2.1 (0.6;10.0)	
- Not married (n=28)	1.0 (0;4.5)	
Children to support		0.019
- Yes (n=40)	2.4 (0;11.8)	
- No (n=20)	0.6 (0;2.4)	
Agent		0.083
- High molecular weight (n=27)	2.4 (0.9;7.0)	
- Low molecular weight (n=32)	0.8 (0;7.0)	
Revenue		0.002
- <30'000 CAD (n=24)	0.2 (0;2.1)	
- ≥30'000 CAD (n=36)	2.6 (0.9;10.0)	
Education		0.080
- Primary and secondary level only (n=33)	1.1 (0.1;3.7)	
- Higher level (n=27)	3.0 (0.6;12.4)	
Years with current employer		0.131
- ≥5 years (n=34)	2.6 (0.6;8.2)	
- <5 years (n=26)	0.9 (0.1;5.3)	

Legend: Data are presented as median values (1.Quartile; 3.Quartile). # Asthma severity was defined according to the Quebec Workers' Compensation Board's definition (0% low severity, 100% maximum severity). YWS: years of exposure with symptoms before removal from exposure.

Table 3: Multiple Linear Regression Coefficients for the effects of different socioeconomic factors on the years of exposure with symptoms before removal from exposure

Variable	Units	A priori model 1	A posterior model 2	A posterior model 3
Age	>40 years vs. ≤40 years (R)	0.499 (0.231) p=0.036	0.539 (0.208) p=0.012	0.489 (0.200) p=0.018
Revenue	<CAD 30000 vs. ≥CAD 30000 (R)	-0.585 (0.245) p=0.020	-0.578 (0.203) p=0.006	-0.433 (0.203) p=0.038
Dependent children	≥1 vs. None (R)	0.357 (0.234) p=0.133	0.371 (0.207) p=0.078	0.376 (0.198) p=0.063
Agent	High-molecular weight vs. Low-molecular weight (R)	NI	0.475 (0.196) p=0.019	0.409 (0.189) p=0.036
Asthma severity#	≥18% vs. <18% (R)	NI	NI	0.515 (0.211) p=0.018
Adjusted R Squared		0.201	0.305	0.364

Legend: Dependent variable: log (Years in the workplace with symptoms prior to claim), Independent variables: regression coefficient Beta, standard of the mean of Beta in parentheses and p-value. NI : variable not included in the model. (R): referent. We initially performed a multivariate linear regression by including socioeconomic variables, as defined a priori in our research hypotheses (A priori Model 1). We then performed a multivariate linear regression using economic variables (a posteriori model 2) and asthma related variables (a posteriori model 3) with a significant relation to YWS in the univariate analysis (see Table 2). The covariates sex, immigration status, marital status and education status were included in the a priori model 1 but are not displayed in the table as the p-values of the coefficient Beta were >0.2. #: Asthma severity was defined according to the Quebec Workers' Compensation Board's definition (0% low severity, 100% maximum severity).

Table 4: Costs of compensation for loss of income (CLI), compensation for functional impairment (CFI), and total costs (in CAD×10^3) according to selected health and socioeconomic factors, type of rehabilitation program and employment status at re-evaluation

Variables	CLI	p-value	CFI	p-value	Total costs	p-value
YWS		0.008		0.092		0.008
- <1year	34.9 (11.4;85.9)		4.5 (2.4;16.3)		43.1 (23.5;106.4)	
- ≥1 year	64.7 (44.6;159.8)		15.0 (6.2;21.0)		84.1 (55.9;180.7)	
Asthma severity		0.009		0.001		0.003
- ≥18 %	71.7 (27.7;149.1)		16.8 (10.5;23.0)		95.6 (51.2;178.9)	
- <18 %	34.9 (24.6;43.9)		3.4 (2.4;10.5)		39.6 (29.8;51.4)	
Age		0.003		0.888		0.001
- ≥40 years	100.4 (34.6;159.8)		15.2 (4.5;21.3)		108.9 (51.7;188.6)	
- <40 years	36.0 (11.7;58.9)		11.1 (2.5;17.9)		40.0 (26.2;70.7)	
Marital status		0.046		0.369		0.068
- Married	64.7 (33.2;152.7)		15.2 (4.5;20.0)		91.4 (40.4;175.4)	
- Not married	39.0 (20.7;84.3)		13.3 (2.4;19.4)		51.4 (29.1;108.7)	
Revenue		0.069		0.465		0.086
- < CAD 30000	37.9 (27.3;64.6)		10.5 (2.5;18.6)		49.5 (36.7;80.3)	
- ≥ CAD 30000	75.5 (20.3;149.1)		15.2 (3.4;19.9)		107.1 (33.6;173.7)	
Income		0.852		0.005		0.528
- Low	58.9 (31.5;145.6)		25.2 (16.0;78.9)		84.1 (37.1;207.3)	
- Other	55.1 (24.2;117.9)		12.3 (2.5;17.8)		66.8 (34.4;127.4)	
Number of employees		0.053		0.152		0.223
- <20 employees	40.9 (16.1;71.7)		16.5 (11.9;20.2)		51.4 (30.1;95.6)	
- ≥20 employees	63.4 (32.2;144.4)		9.8 (2.5;19.3)		70.7 (36.9;177.2)	
Type of rehabilitation program						
- No Program	26.0 (9.2;54.8)[7, 9]		8.2 (2.2;16.1)[2]		36.6 (20.4;62.9)[8, 10]	
- Program without studies	84.9 (57.5;148.3)[7]		9.6 (5.6;30.7)[2]		89.3 (70.8;171.4)[8]	
- Program with studies	64.6 (40.9;130.7)[9]		19.6 (3.5;25.2)		69.2 (55.6;154.6)[10]	
- Help finding a new job*	39.4		6.5		45.9	
Employment status at re-evaluation						

- Without job	44.5 (25.8;101.6)[12]	14.2 (2.2;20.9)	54.4 (36.7;122.6)[13]
- Retraining*	105.2[1]	2.4	107.1
- Retired	127.5 (96.7;183.7)[3, 5, 11, 12]	15.5 (7.9;31.6)	180.7 (112.3;214.1)[4, 6, 13]
- Other employer	40.9 (29.4;61.8)[1, 5, 11]	9.9 (2.5;17.3)	47.5 (36.6;70.8)[6]
- Same employer	9.5 (0.9;135.9)[3]	7.7 (2.7;14.7)	20.6 (7.3;146.8)[4]

Legend: Data are presented as medians (Q1;Q3 in parentheses). * No Q1;Q3 are reported as n≤3. The difference is significant at a $p<0.05$ for the pairs numbered “1, 2, 3, 4” and at a $p<0.01$ for the pairs numbered “5, 6, 7, 8, 9, 10, 11, 12, 13”. YWS=years of exposure with symptoms before removal from exposure.

Table 5: Costs of compensation for loss of income (CLI) and total costs (in CAD×10^3) according to years of exposure with symptoms before removal from exposure, age and employment status at re-evaluation

Variables	Units	Log(CLI)^2 Model 1	Log(CLI)^2 Model 2	Log(total costs) Model 3	Log(total costs) Model 4
Years of exposure with symptoms before removal from exposure	<1 year Vs. ≥1 year (R)	-3.248 (1.1420) p=0.027	-2.187 (1.308) p=0.102	-0.263 (0.113) p=0.024	-0.223 (0.107) p= 0.043
Age	>40 years Vs. <40 years (R)	3.511 (1.433) p=0.018	2.953 (1.464) p=0.050	0.342 (0.113) p=0.004	0.260 (0.120) p=0.035
Employment status at re-evaluation	Without job	NI	4.277 (1.946), p=0.033	NI	0.214 (0.159), p=0.183
	Retraining		8.740 (2.909), p=0.004		0.595 (0.239), p=0.017
	Retired		7.633 (2.060), p=0.001		0.562 (0.172), p=0.002
	Other employer		4.669 (1.825), p=0.014		0.270 (0.151), p=0.081
	Same employer (R)				
Adjusted R squared		0.189	0.370	0.246	0.370

Legend: Dependent variable: log(CLI)^2 and log(total costs). Independent variables (Beta, SE of Beta, p-value) with the exception of the independent variable “employment status at re-evaluation” (β, SE of Beta, p-value). (R): referent. NI : variable not included in the model.

Figure legends:

Figure 1: Correlation of years of exposure with symptoms before removal from exposure with total costs for rehabilitation program (R^2=0.038, r=0.380, p=0.006)

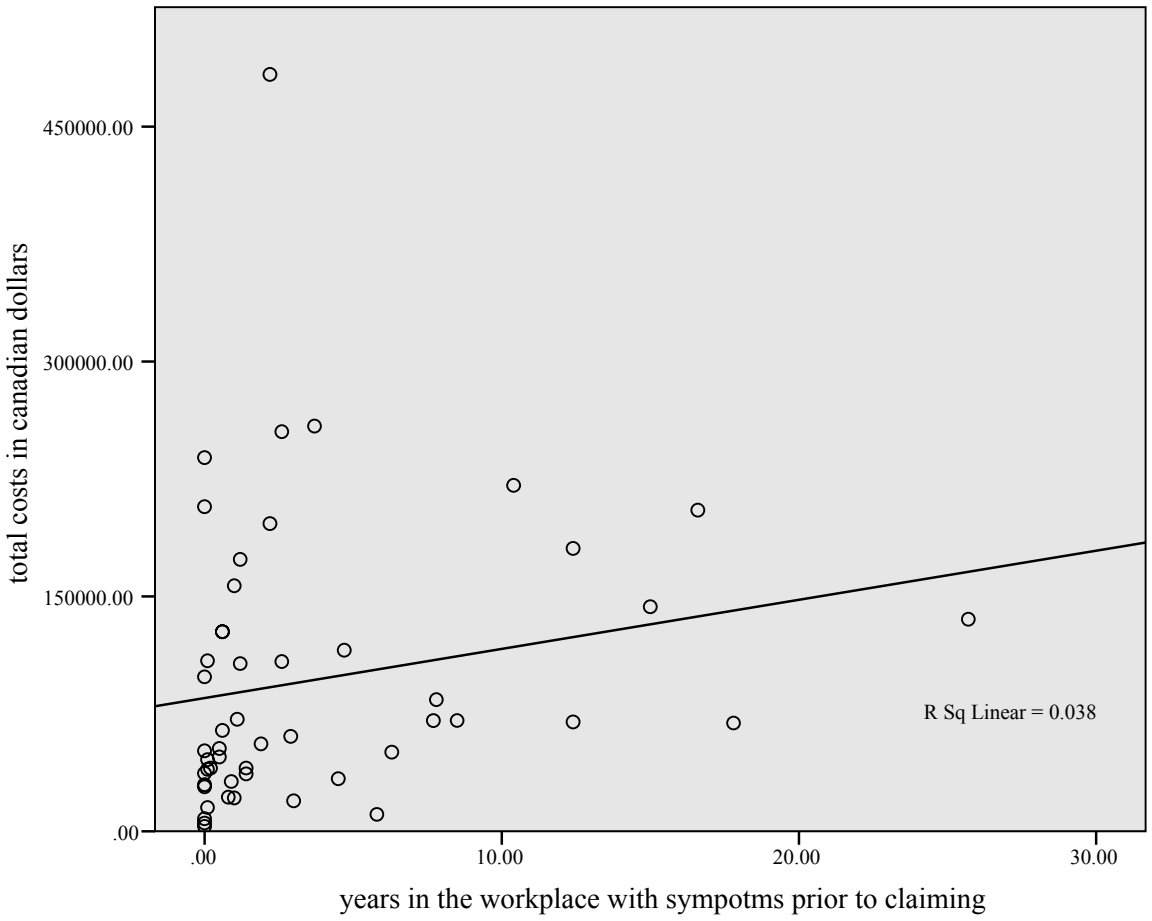

Figure 1