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Chronic Musculoskeletal Pain and Cigarette Smoking among a Representative Sample of Canadian Adolescents and Adults

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Abstract

The present investigation sought to examine the relation between specific types of chronic musculoskeletal pain and cigarette smoking among a large representative sample of adolescents and adults residing in Canada. Specifically, we examined the relations between chronic back pain, arthritis, and daily smoking status. As predicted, individuals with chronic back pain were more likely to smoke than those without chronic back pain or arthritis; this association remained significant after controlling for sociodemographics and any lifetime anxiety or mood disorder. An opposite, albeit less robust, association was evident for the prescence of lifetime arthritis and smoking. Future work is needed to better understand the mechainisms underlying the association between chronic pain and smoking.

Chronic musculoskeletal pain (e.g., back pain, neck pain, limb pain, joint pain) is a prevalent problem associated with high rates of functional impairment and disability in the United States (U.S.) and other regions of the world (Gallagher, 1999; Ohayon & Schatberg, 2003; Turk, 2006). Although persons with chronic pain problems are at an increased risk for certain types of substance abuse and dependence (Brennan, Schutte, & Moos, 2005; Denisco, Chandler, & Compton, 2008; Fishbain, Rosomoff, & Rosomoff, 1992), including perhaps most notably, opioids (Compton & Volkow, 2006), there is comparatively limited study of the linkage between cigarette smoking and chronic pain (Freedman, Saulino, Overton, Holding, & Kornbluth, 2008). Such oversight is unfortunate, as smoking remains the leading cause of morbidity and mortality in industrialized countries despite systematic efforts to prevent and control the use of tobacco (Centers for Disease Control [CDC], 2008).

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Initital studies have found that rates of cigarette smoking are significantly higher for adults with chronic neck or back pain (Jamison, Stetson, & Parris, 1991; Zvolensky, McMillan, Gonzalez, & Asmundson, 2009) or non-specified chronic pain (Ekholm, Gronbaek, Peuckmann, & Sjogren, 2009) compared to those without chronic pain. Additionally, among treatment-seeking adult patients with chronic pain, smoking is associated with higher levels of negative emotional symptoms (Fishbain et al., 2007; John, Meyer, Rumpf, & Hapke, 2009; McGeary, Mayer, Gatchel, & Anagnostis, 2004). Based upon such work, numerous scholars have suggested that persons with chronic pain may be motivated to smoke because they perceive smoking will help them effectively cope with pain and related emotional distress (e.g., depression; Ditre & Brandon, 2008; Fertig, Pomerleau, & Sanders, 1986; Jarvik, Caskey, Rose, Herskovic, & Sadeghpour, 1989; Pomerleau, 1986; Silverstein, 1982). In line with this perspective, smokers with compared to those without chronic pain have reported increased motivation to smoke (Jamison et al., 1991) and demonstrated higher rates of smoking behavior (Hahn, Rayens, Kirsh, & Passik, 2006; Waldie, McGee, Reeder, & Poulton, 2008). These findings are broadly consistent with research indicating a significant concurrent relation between pain severity and smoking rates in clinical studies (Davidson, Davidson, Tripp, & Borshch, 2005) as well as evidence of acute smoking-based analgesia in basic research (Jamner, Girdler, Shapiro, & Jarvik, 1998).

Chronic pain and smoking research, as a whole, is growing. A number of review papers have reported mixed findings concerning the nature of the association between smoking and chronic pain (Goldberg, Scott, & Mayo, 2000; Leboeuf-Yde, 1999). Some scholars have suggested that sampling biases may have influenced, in part, mixed findings across extant work (Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010). To help overcome such potential biases, it is often advisable to employ large representative samples across a developmental spectrum of age (Shiri et al., 2010). It also is noteworthy that past work has generally not evaluated chronic pain-smoking associations by seperating out specific types of chronic pain conditions. As specific types of chronic pain conditions are characterized by distinct ages of onset, etiologies, and maintaning factors (Turk & Melzack, 2001), it would be prudent to extend past work by evaluating whether stronger associations may exist for only certain types of the most common chronic pain problems (e.g., various presentations of chronic musculoskeletal pain).

The purpose of the present study was to examine the relation between chronic musculoskeletal pain and cigarette smoking using a large, representative survey from Canada. Specifically, we used the Canadian Community Health Survey – 2007–2008 (CCHS), which is a nationally representative survey of Canadian citizens age 12 years and older, excluding individuals living on Native Reserves and Crown Lands, institutionalized residents, full-time members of the Canadian Forces, and residents living in certain remote regions. Analyses were completed to document the chronic pain-smoking association among participants with lifetime chronic back pain that occurred exclusive of fibromyalgia and arthritis (medical conditions associated with chronic musculoskeletal pain; Asmundson, Abrams, & Collimore, 2008) compared to those without lifetime chronic back pain or lifetime arthritis. A second set of analyses was completed to evaluate the chronic pain-smoking association among participants with lifetime arthritis that occurred exclusive of fibromyalgia or chronic back pain compared to those without lifetime arthritis or lifetime chronic back pain. It was hypothesized that after adjusting for sociodemographic variables (age, sex, income, education, ethnicity, and marital status) and the presence of a lifetime anxiety or mood disorder, lifetime chronic back pain would be significantly associated with smoking status. We anticipated that a similar association would be evident, although attenuated, when assessed among those with lifetime arthritis.

Method

Participants

Table 1 provides a comprehensive presentation of all demographic variables. A multistage sample allocation strategy was used in the CCHS to help ensure that the number of individuals sampled in each province was proportionate to the size of the population and number of health regions present in the province. Data was gathered between January 2007 and December 2008 with an overall response rate of 76%. Approximately three quarters of the interviews were conducted in person, while the remaining quarter were conducted over the phone by trained lay interviewers depending on logistical barriers and the preference of the interviewee. Every attempt was made to conduct the interview in the respondents' preferred language.

All interviews were conducted with the use of a computer assisted interviewing (CAI) program to increase the reliability and validity of the survey responses. This system automatically generates interviews customized for each respondent based on their individual characteristics and previous responses. Interviewers were trained extensively in the use of the CAI system and interviewer performance and data were regularly evaluated to ensure data quality.

Measures

Smoking status was assessed through self report by asking "at the present time do you smoke cigarettes daily, occasionally, or not at all?" Individuals who indicated that they smoked cigarettes occasionally were excluded from the analysis. The remaining participants were dichotomized into "non-smokers" and "daily smokers." This survey did not differentiate between ex-smokers and individuals who had never smoked a cigarette and did not specify a minimum length of abstinence required to be considered a non-smoker.

Chronic health conditions were assessed on the basis of self-report. Participants were reminded on four occasions to only report chronic conditions diagnosed by a health professional that had lasted six months or longer. Chronic musculoskeletal pain conditions included in the analyses were (a) lifetime back pain excluding fibromyalgia and arthritis, and (b) lifetime arthritis excluding fibromyalgia. In order to create "pure" samples capable of providing a more accurate description of the relationship between each musculoskeletal pain condition and cigarette smoking, individuals with comorbid arthritis and back problems were excluded from the analyses. Similarly, each musculoskeletal pain condition variable was created in a dichotomous fashion wherein individuals with chronic back problems, but no arthritis, were not included in the "no arthritis" category, and vice versa. Mood and anxiety disorder diagnoses were obtained through self-report by asking participants "do you have a mood disorder such as depression, bipolar disorder, mania, or dysthymia?" and "do you have an anxiety disorder such as a phobia, obsessive compulsive disorder, or a panic disorder?" Participants were instructed to only endorse the presence of psychiatric disorders which were diagnosed by a health professional and which had lasted six months or longer.

Data Analytic Approach

Statistical analyses were conducted using SUDAAN software for survey data analyses (SUDAAN version 9.01; Research Triangle Institute) with the appropriate weights provided by the CCHS 2007–2008 in order to more accurately represent the Canadian population. Estimates of variance were conducted using the Taylor Series Linearization procedure in order to correct for the complex statistical sampling procedures employed by the CCHS. Analyses were conducted sequentially in three waves: (a) without adjustment, (b) after adjusting for sociodemographics (age, sex, income, education, ethnicity, and marital status),

and (c) after adjusting for sociodemographics as well as the presence of a lifetime mood or anxiety disorder. Cross-tabulations were calculated to document the prevalence of smoking among participants with lifetime chronic back problems (excluding fibromyalgia and arthritis) or arthritis (excluding fibromyalgia) compared to those without either pain-related condition.

Results

Individuals with lifetime chronic back pain or arthritis differed from those without lifetime chronic back pain or arthritis with regard to age, gender, education, marital status, income, and racial distributions. Specifically, those with lifetime chronic back pain or arthritis tended to be older, female, were more likely to report being currently or formerly married, earned less income, and were more likely to be Caucasian than those without lifetime chronic back pain or arthritis. A different pattern of results was evident for those with chronic back pain or arthritis compared to those without either condition with regard to education. Specifically, individuals with chronic back problems were less likely to have dropped out of high school and were more likely to obtain a post-secondary degree/diploma than those without chronic back pain or arthritis. An opposite pattern of results was evident for those with arthritis compared to individuals without either musculoskeletal pain condition (see Table 1).

Individuals with lifetime chronic back pain were 1.54 (95% CI: 1.44–1.65) times more likely to smoke cigarettes daily than individuals without lifetime chronic back pain or arthritis. This association remained significant ($p < .001$) after adjusting for sociodemographic variables as well as a lifetime history of any mood or anxiety disorders. Specifically, those with lifetime chronic back pain were 1.41 (95% CI: 1.30–1.53) and 1.34 (95% CI: 1.24–1.45) times more likely to smoke cigarettes than those without lifetime chronic back pain or arthritis after adjusting for sociodemographics, and after adjusting for sociodemographics and the presence of any mood or anxiety disorder, respectively (see Table 2).

When the relationship between arthritis and smoking status was examined, a different pattern of results emerged. Specifically, individuals with lifetime arthritis were less likely (AOR = 0.89; 95% CI: 0.80–1.00) to smoke cigarettes daily compared to those without lifetime arthritis or chronic back pain after adjusting for sociodemographics and the presence of any mood or anxiety disorder. This association was not statistically significant when examined without the aformentioned adjustments (see Table 3).

Discussion

The overarching purpose of the present study was to examine the relationship between chronic musculoskeletal pain and smoking status using a representative survey of Canadian citizens age 12 years and older. Consistent with our hypothesis, after adjusting for sociodemographic variables and the presence of a lifetime anxiety or mood disorder, individuals with a lifetime history of chronic back pain were significantly more likely to smoke cigarettes daily than those without lifetime chronic back pain or arthritis. These findings replicate past work documenting an association between the co-occurrence of chronic pain and smoking among exclusively adult samples (Ekholm et al., 2009; Zvolensky et al., 2009) and uniquely extend it to a large representative sample of Canadian adolescents and adults. Overall, approximately 23.3% of persons with chronic back pain were smokers compared to 16.5% without chronic back pain problems. Thus, these data document a relatively robust and clinically significant association between lifetime chronic back pain and smoking. Indeed, the chronic back pain-smoking association was not attributable to the

prescence of fibromyalgia or arthritis, and was not better accounted for by other factors known to co-occur with smoking and chronic pain (e.g., anxiety and mood disorders).

A second set of analyses focused on the association between smoking and lifetime arthritis. Specifically, individuals with lifetime arthritis were significantly less likely to smoke cigarettes daily than individuals without a history of arthritis or chronic back pain, but only after adjusting for sociodemographic variables and the presence of a lifetime anxiety or mood disorder. The overall magnitude of the observed negative association between smoking and arthritis was less robust than that observed for chronic back pain. These results are inconsistent with past work documenting modest positive relations between arthritis and smoking (Hutchinson, Shepstone, Moots, Lear, & Lynch, 2001; Silman, Newman, & MacGregor, 1996; Stolt et al., 2003). Methodological factors may have influenced, in part, the discrepancy between the current study and that of earlier work (e.g., nature of the interviews, hierarchical analytic model versus non-hierarchical model). Nonetheless, individuals with chronic back pain, relative to arthritis, are more apt to experience pronounced site-specific aversive internal sensations. In this context, it is possible persons with chronic back pain may be more apt to regulate such focal (back) pain sensations via smoking.

The current findings add uniquely to extant scientific knowledge concerning chronic pain and smoking. Results suggest chronic back pain is related to cigarette smoking, but that such relations do not uniformly apply to the same degree to all types of chronic musculoskeletal pain. Although the present data cannot address why such an association may exist, smoking and certain types of chronic pain may influence one another in a mutual maintenance type of model. For example, one possibility is that the presence of some forms of chronic pain may alter the reinforcing effects of drugs (Jacobs, Smith, de Vries, & Schoffelmeer, 2003). It is presently empirically unclear if chronic low back pain directly affects nicotine administration or its reinforcing value. However, smoking may serve important affect regulation functions for smokers with chronic low back pain. For example, these individuals may believe smoking will help manage aversive states like pain. Although the objective mood-dampening qualities of smoking are complex (Kassel, Stroud, & Paronis, 2003), in the absence of other more adaptive coping strategies, people with chronic back pain may learn to rely on smoking to manage noxious internal states. In such a scenario, a forward feed cycle may develop, whereby smoking is used as a coping strategy for managing aversive emotional and bodily states in the short term yet paradoxically confer longer-term risk for adverse health consequences. Another non-mutually exclusive possibility is that, due to the health consequences of smoking (e.g., coughing, lung impairment), smokers may be prone to exacerbate their chronic low back pain problem by suffering from other types of smoking-based health impairment. For example, recurrent coughing or respiratory distress may contribute to re-injury of a chronic low back pain problem. Although this perspective would suggest smokers with chronic pain would benefit from quitting, they may have more difficulty doing so, especially when relying on smoking to cope with aversive internal states.

There are a number of limitations to the present study. First, the cross-sectional design of this study does not permit conclusions regarding the direction of the observed associations. Future prospective work could attempt to isolate the onset and patterning between chronic pain and smoking. Second, while the present results are generalizable to the vast majority of the Canadian population, it is not clear whether they are applicable to other countries. Future studies examining the cross-national stability of the observed results are therefore an important next scientific step. Third, the present study was focused on clarifying if a relation was evident between two forms of chronic musculoskeletal pain (e.g., back pain and arthritis) and smoking. Future investigations could usefully build upon such work by attempting to explicate mediating and moderating processes involved in such linkages and

by increasing explorations of specificity effects through comparison of a wider range of chronic musculoskeletal pain conditions. Fourth, as diagnoses were derived through interview, there is necessarily some caution that should be exercised in regard to the validity of the diagnoses. For example, it is conceivable that the participants may have had difficulty distinguishing between specific chronic pain problems. Finally, the CCHS survey did not include a formal or comprehensive assessment of smoking behavior, nicotine dependence, or other substance use disorders. Future work would therefore benefit by documenting the co-occurrence of chronic musculoskeletal pain with nicotine dependence as well as attempt to parse apart how specific such relations are relative to other forms of substance use among this clinical population. Exploration of dose-response relations (e.g., rate of smoking and degree of chronic pain) may be an especially useful next research step.

Overall, the present findings highlight a disparate association between types of chronic musculoskeletal pain and smoking status among Canadian citizens as young as 12 years of age. Results suggest a growing need for scholarly and clinical attention to be directed at addressing smoking in the context of certain types of chronic pain problems, particularly chronic back pain.

References

Asmundson, GJG.; Abrams, MP.; Collimore, KC. Pain and anxiety disorders. In: Zvolensky, MJ.; Smits, JA., editors. Anxiety in health behaviors and physical illness. Series in anxiety and related disorders. New York, NY, US: Springer Science & Business Media; 2008.

Brennan PL, Schutte KK, Moos RH. Pain and use of alcohol to manage pain: Prevalence and 3-year outcomes among older problem and non-problem drinkers. Addiction 2005;100:777–786.10.1111/j.1360-0443.2005.01074.x [PubMed: 15918808]

Center for Disease Control and Prevention. Targeting tobacco use: The nation's leading cause of preventable death 2008. 2008. http://www.cdc.gov/nccdphp/publications/aag/pdf/osh.pdf

Compton WM, Volkow ND. Major increases in opioid analgesic abuse in the United States: Concerns and strategies. Drug and Alcohol Dependence 2006;81:103–107.10.1016/j.drugalcdep.2005.05.009 [PubMed: 16023304]

Davidson M, Davidson P, Tripp D, Borshch Y. Cigarette smoking and chronic pain: Relationship to pain severity and affective distress. The Journal of Pain 2005;6:S61.10.1016/j.jpain.2005.01.240

Denisco RA, Chandler RK, Compton WM. Addressing the intersecting problems of opioid misuse and chronic pain treatment. Experimental and Clinical Psychopharmacology 2008;16:417–428.10.1037/a0013636 [PubMed: 18837638]

Ditre JW, Brandon TH. Pain as a motivator of smoking: Effects of pain induction on smoking urge and behavior. Journal of Abnormal Psychology 2008;117:467–472.10.1037/0021-843X.117.2.467 [PubMed: 18489224]

Ekholm O, Gronbaek M, Peukmann V, Sjogren P. Alcohol and smoking behavior in chronic pain patients: The role of opioids. European Journal of Pain 2009;13:606–612.10.1016/j.ejpain.2008.07.006 [PubMed: 18774317]

Fertig JB, Pomerleau OF, Sanders B. Nicotine-produced antinociception in minimally deprived smokers and ex-smokers. Addictive Behaviors 1986;11:239–248.10.1016/0306-4603(86)90052-3 [PubMed: 3739811]

Fishbain DA, Lewis JE, Cole B, Cutler RB, Rosomoff HL, Rosomoff RS. Variables associated with current smoking status in chronic pain patients. Pain Medicine 2007;8:301–311.10.1111/j.1526-4637.2007.00317.x [PubMed: 17610452]

Fishbain DA, Rosomoff HL, Rosomoff RS. Review article: Drug abuse, dependency, and addiction in chronic pain patients. The Clinical Journal of Pain 1992;8:77–85.10.1097/00002508-199206000-00003 [PubMed: 1633386]

Freedman M, Saulino M, Overton A, Holding M, Kornbluth I. Therapeutics in pain management. Archives of Physical Medicine and Rehabilitation 2008;89:S56–60. [PubMed: 18295652]

Gallagher, RM. The medical clinics of North America: Chronic pain. Philadelphia, PA: W. B. Saunders Company; 1999.

Goldberg MS, Scott SC, Mayo NE. A review of the association between cigarette smoking and the development of nonspecific back pain and related outcomes. Spine 2000;25:995–1014.10.1097/00007632-200004150-00016 [PubMed: 10767814]

Hahn EJ, Rayens MK, Kirsh KL, Passik SD. Brief report: Pain and readiness to quit smoking cigarettes. Nicotine & Tobacco Research 2006;8:473–480.10.1080/14622200600670355 [PubMed: 16801305]

Hutchinson D, Shepstone L, Moots R, Lear JT, Lynch MP. Heavy cigarette smoking is strongly associated with rheumatoid arthritis (RA), particularly in patients without a family history of RA. Annals of the Rheumatic Diseases 2001;60:223–227.10.1136/ard.60.3.223 [PubMed: 11171682]

Jacobs EH, Smith AB, de Vries, Schoffelmeer AN. Neuroadaptive effects of active versus passive drug administration in addiction research. Trends in Pharmacological Sciences 2003;24:566–573.10.1016/j.tips.2003.09.006 [PubMed: 14607079]

Jamison RN, Stetson BA, Parris WC. The relationship between cigarette smoking and chronic low back pain. Addictive Behaviors 1991;16:103–110.10.1016/0306-4603(91)90002-Y [PubMed: 1829566]

Jamner LD, Girdler SS, Shapiro D, Jarvik ME. Pain inhibition, nicotine, and gender. Experimental and Clinical Psychopharmacology 1998;6:96–106.10.1037/1064-1297.6.1.96 [PubMed: 9526150]

Jarvik ME, Caskey NH, Rose JE, Herskovic JE, Sadeghpour M. Anxiolytic effects of smoking associated with four stressors. Addictive Behaviors 1989;14:379–386.10.1016/0306-4603(89)90025-7 [PubMed: 2782121]

John U, Meyer C, Rumpf H, Hapke U. Nicotine dependence criteria and nicotine withdrawal symptoms in relation to pain among an adult general population sample. European Journal of Pain 2009;13:82–88.10.1016/j.ejpain.2008.03.002 [PubMed: 18436459]

Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: Correlation, causation, and context across stages of smoking. Psychological Bulletin 2003;129:270–304.10.1037/0033-2909.129.2.270 [PubMed: 12696841]

Leboeuf-Yde C. Smoking and low back pain: A systematic literature review of 42 journal articles reporting 47 epidemiologic studies. Spine 1999;24:1463–1470.10.1097/00007632-199907150-00012 [PubMed: 10423792]

McGeary DD, Mayer TG, Gatchel RJ, Anagnostis C. Smoking status and psychosocioeconomic outcomes of functional restoration in patients with chronic spinal disability. Spine Journal 2004;4:170–175.10.1016/j.spinee.2003.08.030 [PubMed: 15016394]

Ohayon MM, Schatzberg AF. Using chronic pain to predict depressive morbidity in the general population. Archives of General Psychiatry 2003;60:39–47.10.1001/archpsyc.60.1.39 [PubMed: 12511171]

Pomerleau OF. Nicotine as a psychoactive drug: Anxiety and pain reduction. Pyschopharmacology Bulletin 1986;22:865–869.

Research Triangle Institute (RTI). Software for Survey Data Analyses (SUDAAN) Version 9.01. Research Triangle Park, NC: RTI; 2004.

Shiri R, Karppinen Leino-Arjas P, Solovieva S, Viikari-Juntura E. The association between smoking and low back pain: A meta-analysis. The American Journal of Medicine 2010;123:87.e7–87.e35.10.1016/j.amjmed.2009.05.028 [PubMed: 20102998]

Silman AJ, Newman J, MacGregor AJ. Cigarette smoking increases the risk of rheumatoid arthritis: Results from a nationwide study of disease-discordant twins. Arthritis & Rheumatism 1996;39:732–735.10.1002/art.1780390504 [PubMed: 8639169]

Silverstein B. Cigarette smoking, nicotine addiction, and relaxation. Journal of Personality and Social Psychology 1982;42:946–950.10.1037/0022-3514.42.5.946 [PubMed: 7086634]

Stolt P, Bengtsson C, Nordmark B, Lindblad S, Lundberg I, Klareskog L, et al. Quantification of the influence of cigarette smoking on rheumatoid arthritis: Results from a population based case-control study, using incident cases. Annals of the Rheumatic Diseases 2003;62:835–841.10.1136/ard.62.9.835 [PubMed: 12922955]

Turk DC. Pain hurts: Individuals, significant others, and society! APS Bulletin 2006;16:3.

Turk, DC.; Melzack, R. Handbook of Pain Assessment. 2. New York, NY: Guilford Press; 2001.

Waldie KE, McGee R, Reeder AI, Poulton R. Associations between frequent headaches persistent smoking, and attempts to quit. Headache: The Journal of Head and Face Pain 2008;48:545–552.10.1111/j.1526-4610.2007.01037.x

Williams JM, Ziedonis D. Addressing tobacco among individuals with a mental illness or an addiction. Addictive Behaviors 2004;29:1067–1083.10.1016/j.addbeh.2004.03.009 [PubMed: 15236808]

Zvolensky MJ, McMillan K, Gonzalez A, Asmundson GJG. Chronic pain and cigarette smoking and nicotine dependence among a representative sample of adults. Nicotine and Tobacco Research 2009;11:1407–1414.10.1093/ntr/ntp153 [PubMed: 19828432]

Table 1

Sociodemographic Factors in Chronic Musculoskeletal Pain

	No LT Chronic Back Problems or Arthritis (n = 76,204) *n (%)*	LT Chronic Back Problems (n = 16,042) *n (%)*	LT Arthritis (n = 13,925) *n (%)*
Age			
12–19	11,779 (15.7)	1,019 (6.4)	74 (0.6)
20–29	11,004 (19.1)	1,994 (15.6)	216 (2.8)
30–39	12,946 (17.3)	2,923 (19.4)	512 (4.8)
40–49	11,876 (18.6)	3,124 (23.7)	1,112 (11.9)
50+	28,599 (29.3)	6,982 (35.0)	12,011 (79.8)
Chi-Squared		***702.78******	***3891.73******
Sex			
Male	36,956 (51.6)	7,553 (49.9)	4,773 (38.1)
Female	39,248 (48.4)	8,489 (50.1)	9,152 (61.9)
Chi-Squared		***5.64****	***269.07******
Education			
Less Than High School	19,566 (22.9)	3,293 (17.5)	4,538 (28.9)
No Post-Secondary Education	11,583 (15.4)	2,473 (15.5)	2,081 (16.2)
Some Post Secondary Education	5,528 (8.5)	1,259 (9.0)	793 (6.3)
Post-Secondary Degree/Diploma	37,663 (53.2)	8,626 (58.0)	6,071 (48.7)
Chi-Squared		***103.26******	***97.96******
Marital Status			
Married/Cohabitating	38,530 (55.4)	8,981 (62.8)	7,431 (64.8)
Separated/Divorced/Widowed	11,236 (9.1)	2,829 (11.6)	5,101 (25.9)
Never Married	26,289 (35.5)	4,200 (25.6)	1,355 (9.3)
Chi-Squared		***247.32******	***1986.21******
Household Income			
$0–$19,999	6,611 (7.3)	1,617 (8.3)	2,346 (13.3)
$20,000–$39,999	12,824 (16.4)	2,974 (18.2)	3,581 (25.4)
$40,000–$59,999	12,067 (18.1)	2,613 (17.2)	2,183 (19.5)
$60,000+	32,646 (58.2)	6,549 (56.4)	3,338 (41.7)
Chi-Squared		***18.68******	***426.61******
Race			
Caucasian	62,398 (78.0)	13,604 (82.9)	12,350 (87.7)
Visible Minority	11,088 (22.0)	1,892 (17.1)	974 (12.3)
Chi-Squared		***54.41******	***142.11******

Note. All *n*'s were unweighted. All percents were weighted. LT = lifetime.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

Table 2

The Relationship Between Chronic Back Problems and Smoking Status

	No LT Chronic Back Problems or Arthritis (*n* = 72,605)	**LT Chronic Back Problems (*n* = 15,251)**
Non Smoker (n= 71, 143)	59, 689 (83.5)	11, 454 (76.6)
Daily Smoker (n = 16, 713)	12, 916 (16.5)	3, 797 (23.4)
OR (95% CI)	1.00	**1.54 (1.44–1.65)*****
AOR-1 (95% CI)	1.00	**1.41 (1.30–1.53)*****
AOR-2 (95% CI)	1.00	**1.34 (1.24–1.45)*****

Note. All *n*'s were unweighted. All percents were weighted. LT = lifetime. OR = odds ratio. AOR = adjusted odds ratio.

AOR-1 indicates adjustments for age, marital status, income, education, race, and sex.

AOR-2 indicates adjustments for age, marital status, income, education, race, sex, and any mood or anxiety disorder.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

Table 3

The Relationship Between Arthritis and Smoking Status

	No LT Arthritis or Chronic Back Problems (*n* = 72,605)	**LT Arthritis (*n* = 13,540)**
Non Smoker (n=71, 154)	59, 689 (83.5)	11, 465 (84.3)
Daily Smoker (n = 14, 991)	12, 916 (16.5)	2, 075 (15.7)
OR (95% CI)	1.00	0.94 (0.86–1.03)
AOR-1 (95% CI)	1.00	0.94 (0.84–1.04)
AOR-2 (95% CI)	1.00	**0.89 (0.80–1.00)***

Note. All *n*'s were unweighted. All percents were weighted. LT = lifetime. OR = odds ratio. AOR = adjusted odds ratio.

AOR-1 indicates adjustments for age, marital status, income, education, race, and sex.

AOR-2 indicates adjustments for age, marital status, income, education, race, sex, and any mood or anxiety disorder.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.