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**ABSTRACT**

**Aims:** To assess the impact of involuntary job loss due to plant closure or layoff on relapse to smoking and smoking intensity among older workers.

**Design, Participants, Sample:** Data come from the Health and Retirement Study, a nationally representative survey of older Americans aged 51-61 in 1991 followed every 2 years beginning in 1992. The 3,052 participants who were working at the initial wave and had any history of smoking comprise the main sample.

**Methods (Measures):** Primary outcomes are smoking relapse at Wave 2 (1994) among baseline former smokers, and smoking quantity at Wave 2 among baseline current smokers. As reported at the Wave 2 follow-up, 6.8 percent of the sample experienced an involuntary job loss between Waves 1 and 2.

**Findings:** Older workers have over two times greater odds of relapse subsequent to involuntary job loss than those who did not. Further, those who were current smokers prior to displacement that did not obtain new employment were found to be smoking more cigarettes, on average, post job loss.

**Conclusions:** The stress of job loss, along with other significant changes associated with leaving one's job, which would tend to increase cigarette consumption, must outweigh the financial hardship, which would tend to reduce consumption. This highlights job loss as an important health risk factor for older smokers.

**KEYWORDS** Involuntary job loss, smoking relapse, employment, older workers

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## **INTRODUCTION**

Deciphering the causes of, and risk factors for, increased smoking and relapse among older individuals is an important public health concern. As extensively documented in the Surgeon General's Report on the health consequences of smoking, many current and former smokers begin to suffer the negative health consequences of a lifetime of smoking as they reach late middle age [1]. Fortunately, a range of research illustrates the many potential benefits to smoking cessation for older smokers [2-7]. At the same time, the risk of relapse should not be ignored in this population. Many older individuals remain vulnerable to relapse even after many years of successful abstinence [8, 9].

Employment changes represent significant life events that may affect many types of health and economic outcomes. As such, the occurrence of an involuntary job loss may present an important risk for older smokers. This study uses a nationally representative longitudinal survey of older Americans to investigate the effect of involuntary job loss on several smoking measures, including relapse, smoking cessation, and smoking quantity.

A considerable body of research has demonstrated the detrimental effects of job loss on health related outcomes [10-14]. As concerns about these negative outcomes have driven investigation into mechanisms for these effects, the impact of unemployment and/or job loss on lifestyle risk factors, such as use of tobacco and alcohol and obesity, have been of particular interest [11, 13, 15, 16]. However, consensus on the direction and magnitude of these effects, particularly in the area of tobacco use, has not been reached.

Part of the problem with attaining consensus on the relationship between job loss and smoking is due to the complex relationship between smoking and employment. The relationship between tobacco use and unemployment is multi-faceted. Studies have found that smokers are

less likely to be employed [16, 17], earn less money than their non-smoking counterparts [18], have more absences from work [19-21], and are at higher risk for layoff [14]. Consequently, concluding that unemployment or job loss *causes* increased or decreased use of tobacco is difficult. Panel data afford the possibility to consider both predictors of job loss and consequences of job loss.

Conceptually, it is also difficult to determine the likely effect of involuntary job loss on smoking behavior. The loss of a job represents a salient life event that can often produce various symptoms of poor mental health, primarily subclinical symptomatology [15]. Recent research has explored these effects in older workers and found them to be significant [22]. Since stress is a known risk factor for smoking relapse [23, 24], this represents a plausible link between involuntary job loss and subsequent relapse to smoking. As stress has been further linked to smoking intensity and prevalence [25-28], it is possible that stress associated with job loss and subsequent unemployment or reemployment may be likely to increase smoking quantity among current smokers.

On the other hand, while stressful life events in general have been more clearly linked to smoking relapse [29], the financial difficulties associated with job loss may cause a push in the opposite direction. Since unemployment leaves individuals with less discretionary income, individuals may simply decide to forgo consumption of tobacco. For instance, the possibility that recessions are good for health has been highlighted by ecological and cross-sectional evidence linking higher unemployment rates with lower rates of smoking in both the U.S. and Sweden [30, 31]. This may not be surprising given older workers' financial losses following job loss [32].

There are, however, other plausible links between smoking and job loss, such as the possible removal of individual smoking controls, such as worksite smoking bans, or the

introduction of a potentially undesirable increase in leisure time during unemployment. Job loss disrupts the balance of time devoted to labor and leisure, affecting both individuals and their families [33]. Worksite smoking bans have been shown to lower the rate of smoking in worksites that have them [34, 35]. It is thus conceivable that removing a worker from an environment that contains a ban on smoking could promote relapse, discourage cessation, or increase the quantity an individual smokes.

A limited number of longitudinal studies have explored the association between job loss and smoking behavior. These studies, which compared individuals displaced via layoff or business closure with a comparable control group of continuously employed workers have generally found no relationship between job layoff and smoking behavior [36-38]. The results of the Michigan study, [38] which followed men whose unemployment resulted from a permanent plant closure, indicated stable tobacco use over time, and no significant response to the experience of job loss. Similarly, the British Regional Heart Study findings, also based on male subjects, suggested no evidence of increases in the level of smoking among non-employed participants, relative to continuously employed individuals [37]. This study, moreover, found a significant relationship between non-employment and smoking cessation, among subjects who reported smoking at the study baseline. A more recent Japanese inquiry [36], which studied various measures of health among employees displaced by the bankruptcy of a shoemaking company, reported virtually unchanged daily smoking prevalence rates at 3 follow-up measurements. While the authors indicate that cigarette consumption rates increased at rates considerably higher among the unemployed than among other subjects, it is unclear whether this difference is statistically significant. Furthermore, this study's analysis was not adjusted for

potentially important covariates and confounding influences, and, as with the Michigan research, was a single-site study, a shortcoming of which is a lack of suitable controls.

In this study we use data from the Health and Retirement Study (HRS) to consider the effect of involuntary job loss between the first two Waves (1992 and 1994) on changes in smoking behavior over that same period. As this study uses panel data, we are able to observe changes in employment status and smoking behavior, as opposed to relying on cross-sectional relationships between unemployment and smoking status. We consider three different measures of smoking and two distinct groups of ever smokers (those with a history of smoking at baseline). Among baseline smokers, we examine differences in smoking quantity by job loss status, and consider differences in cessation likelihood. Among former smokers, we also analyze differences in relapse likelihood by job loss occurrence. In sum, we focus on job loss as a risk factor for increased smoking quantity, lower rates of cessation, and increased rates of relapse among older workers in a population-based sample of older workers.

## **METHODS**

### **Data**

This study uses data from the first two Waves (1992 and 1994) of the Health and Retirement Survey (HRS). The HRS is a nationally representative, longitudinal survey of individuals born between 1931 and 1941 and their spouses. It was designed to investigate the experiences of older workers as they advance from work to retirement, with particular emphasis on trajectories of health and well-being. HRS data are collected at two-year intervals, beginning in 1992. At the baseline, in-home, face-to-face interviews were taken from 12,652 participants who represented 7,702 households. Blacks, Hispanics, and Florida residents were oversampled.

At all subsequent survey dates, respondents were interviewed by mail or telephone. HRS data collection is conducted by the Institute for Social Research at the University of Michigan. The HRS is described in greater detail elsewhere [39].

### **Sample**

The eligible sample comprised HRS respondents who reported working, excluding the self-employed, at the Wave 1 (1992) baseline ( $n = 5,462$ ). Of these individuals, we retained 4,856 respondents who contributed data at both the baseline and Wave 2 (1994) follow-up surveys. Next, we identified 3,100 individuals who reported having ever smoked cigarettes. Forty-eight of these individuals were then eliminated because of missing values in one or more study variables, leaving a final study sample numbering 3,052. Thirteen participants lacked the data necessary to ascertain whether an involuntary job loss occurred, and 10 were missing smoking quantity at the Wave 2 follow-up. Other missing data were distributed across the remaining study variables. A multiple imputation procedure was used to assign missing values for one variable (number of years since participant quit smoking), whose complete data were judged to be critical to the evaluation of smoking relapse risk.

We used bivariate analysis to test for systematic differences between study sample members and individuals omitted because of missing data. Although the results suggest that, on balance, the two groups were similar, we did find that individuals excluded because of missing data had lower labor income ( $p < .01$ ), and were more likely to be displaced ( $p < .001$ ), non-married ( $p < .05$ ), and non-white ( $p < .01$ ) than study participants.

Two primary analytic samples are considered. The first is the population of current smokers at baseline and the second is the population of former smokers at baseline. These samples total 1,203 and 1,849 respectively.

## Measures

### Outcome Variables

#### *Follow-up Smoking Quantity*

Smoking quantity, assessed at the Wave 2 follow-up, measures daily cigarette consumption among smokers. This variable was recoded from the original survey question, which asked, “*About how many cigarettes or packs do you smoke in a day now?*”

#### *Smoking Cessation*

Smoking cessation is a binary (0, 1) variable which indicates the absence of smoking at Wave 2 among individuals who reported smoking at Wave 1. This variable was defined by first identifying individuals at Wave 1 who reported that they were currently smoking, and then tracking the Wave 2 smoking behavior of these same individuals. Those smoking at Wave 2 are coded as 0, whereas those who are not smoking are coded as 1.

#### *Smoking Relapse*

Smoking relapse is also coded as a binary (0, 1) variable, which reflects the onset of cigarette use among former smokers. To construct this variable, we first identified respondents who, at the Wave 1 baseline, reported they did not currently smoke cigarettes, but had previously smoked cigarettes. We then considered the Wave 2 smoking behavior of these individuals. Thus, we use a point prevalence measure of relapse, since information on smoking status and quantity between waves is not available. This approach is similar to that employed in other research using data of this type [29, 40].

### Explanatory Variables

#### *Job Loss*

Involuntary job loss is defined as the loss of a job due to business/plant closing or layoff. In this study, the variable representing job loss was operationalized in two ways. First, for the smoking quantity outcome, involuntary job loss was designed to account for both the experience of job loss and the potential moderating impact of subsequent employment transitions. We therefore created a measure of involuntary job loss that is represented by four binary (0, 1) variables. These variables represent involuntary job loss, accompanied by: reemployment in a full-time position, reemployment in a part-time position, continued unemployment, or retirement. A fifth variable, which indicates the absence of job loss, was used as our referent variable. Second, since for the smoking cessation and smoking relapse outcomes the data lack the statistical power necessary to use the disaggregated measure, we used a binary variable to capture the average effect of job loss. In this variable, 1 indicates involuntary job loss between Waves 1 and 2 of the Survey, and 0 indicates the absence of involuntary job loss.

### *Control Variables*

An extensive set of variables, from several domains, was assessed for inclusion in our models. We selected covariates for multivariable analysis based on previously reported findings [41, 42], hypothesized relationships to the outcomes, and bivariate associations (selection criterion:  $p < .05$ ). Multivariable models were pruned in a backward selection process (selection criterion:  $p < .20$ ), although a number of variables of interest not meeting the criterion, principally factors with demonstrated associations to the outcome in earlier research, were retained. Demographic variables included age in years, sex (1 = female), race (1 = white), marital status (1 = married), and education in years. Posited socioeconomic controls included annual labor earnings (in 1991) and blue collar occupation, non-housing net worth, and job tenure in years. Health/medical variables included Wave 1 depressive symptoms, based on the

CESD-8 [43], a shortened form of the 20-item CESD battery, Wave 1 physical functioning, adapted from previous research on this cohort [22], and binary controls for the onset of major chronic diseases (diabetes, cancer, heart disease, lung disease) between survey waves. Controls for health behavior included two dummy variables for concurrent (Wave 2) alcohol use (heavy use, moderate use, vs. no use) and Wave 1 spousal smoking. Heavy alcohol use was defined as a self report of 3 or more drinks per day; moderate use was defined as 2 or fewer drinks per day. Spousal smoking controls comprised dummy variables for both history of smoking and current smoking status. In addition, the smoking quantity model contained a Wave 1, pre-separation, control for respondent smoking quantity, while the smoking relapse model included a control for the number of years since the respondent last smoked cigarettes.

### **Sample Characteristics**

Table 1 presents descriptive statistics for the full sample, and for the sub-samples considered in the smoking quantity and smoking relapse analyses. These statistics describe characteristics of these two distinct analytic samples, reporting both relevant outcomes for each group and means of job loss and control variables for each group. Overall, the two combined samples averaged nearly 56 years of age, was just under half female, and about four-fifths White. More than three-quarters of the sample was married, and over two-thirds worked in white-collar occupations. Fifty-seven percent of participants reported moderate alcohol consumption, while just 6% reported heavy use. Incident cancer and heart disease percentages were 1.4% and 2.3%, respectively. About 22% of sample members' spouses smoked. Among Wave 1 smokers, daily cigarette consumption averaged nearly 1 pack. Current smokers also had a higher proportion of spouses who smoked than the full sample, and had a higher proportion of individuals who

reported heavy alcohol consumption. The mean time from smoking cessation, among the former smokers was 16 years (median = 14 years).

\*\*\*\* INSERT TABLE 1 NEAR HERE \*\*\*\*

A total of 208 (6.8%) of the sample experienced involuntary job loss within the study frame. This included 94 (7.8%) individuals in the subsample of Wave 1 smokers, and 114 (6.2%) individuals in the subsample of Wave 1 former smokers. Of the total 208 workers who experienced involuntary job loss, 120 (57.7%) returned to work: 82 in full-time positions, and 38 in part-time jobs. Forty-seven (22.6%) remained unemployed at the Wave 2 survey, whereas 41 (19.7%) reported that they had retired.

### **Analyses**

Using multivariate regression analysis, we estimated a series of models of smoking among current and former smokers. *Among Wave 1 current smokers*, we evaluated two outcomes. First, we evaluated follow-up smoking quantity, both among participants who reported smoking at Wave 1, and among the sub-sample of individuals who reported smoking at both Wave 1 and Wave 2. Second, we evaluated smoking cessation at Wave 2. *Among Wave 1 former smokers*, we assessed the likelihood of smoking relapse at Wave 2. Additionally, we performed several robustness checks, including tests of non-random selection into and out of smoking and tests of potential endogeneity of the exposure variable.

#### *Smoking Quantity*

We estimated three models of smoking quantity. The first two models estimated the unadjusted and adjusted association between involuntary job loss and daily cigarette consumption for the sample of participants who were smoking at the Wave 1 study baseline. As

some 17 percent of these individuals quit smoking between waves, a third model reports adjusted effects of involuntary job loss on follow-up smoking quantity exclusively among Wave 1 smokers who continue to smoke at Wave 2.

### *Smoking Cessation and Relapse*

We estimated unadjusted and fully adjusted models of smoking cessation using logistic regression to account for the binary nature of this outcome variable. Further, we pursued using a Heckman sample selection correction (described below) to account for Wave 2 smoking status when estimating the effect of job loss on smoking quantity [44]. The models of smoking relapse were fit in a similar fashion, also using logistic regression. For this outcome, we estimated unadjusted, partially adjusted, and fully adjusted models.

### *Endogeneity and Other Specification Concerns*

A potential concern with our exposure variable is that job loss may be a consequence, as well as a predictor, of smoking behavior. In this case, individuals who consume cigarettes might be differentially selected for job loss in the case of layoff. If so, then the exposure variable would be at least partially determined by another explanatory variable (i.e., endogenously), leaving estimates of the effect of job loss on subsequent smoking behavior biased. We used a Hausman specification test [45], a two-stage instrumental variable (IV) procedure, to evaluate the possible endogeneity of involuntary job loss. As the results of IV estimation have been shown to be sensitive to the instrumental variable selected [46], we ran this test with a number of instrumental variables, all of which were judged to be valid. The results of this test (not shown) consistently suggested that involuntary job loss is not endogenously determined.

Another, related concern is to ensure that our analytic samples are not biased by selection. In the smoking quantity analysis, the outcome is censored at zero for non-smokers.

Thus, if the decision to smoke at follow-up (when the outcome is measured) is the result of a nonrandom process, then our estimates of the effect of job loss on later smoking quantity will be inconsistent. A similar bias may arise in the relapse analysis, where to conform to the status of “former smoker,” one must have previously made the decision to quit smoking, a decision that could also have a nonrandom basis. To correct for possible selection bias, we use the Heckman sample selection technique. The Heckman method, a two-step maximum likelihood estimation technique, was applied in the following manner. In the smoking quantity analysis, we estimated a binary probit to assess the predictors of the probability of smoking, where the decision to smoke is assumed to be a non-random selection process. Then, we fit a linear regression model of smoking quantity, conditional on smoking, using all relevant explanatory variables, including the set of dummy variables representing involuntary job loss, and a supplementary regressor, computed from the predicted probability of smoking obtained from the first-stage probit. Similarly, in the smoking relapse analysis, we first estimated the correlates of being a former smoker with a probit model where the decision to become a former smoker by baseline (1992) is estimated as a separate selection equation (similar to the smoking quantity case). Then, in step 2, we fit a second probit for the likelihood of smoking relapse. (Both models were identified in the manner described above for smoking quantity.) As the results of the Heckman analyses did not alter the basic findings they are not presented.

### *Moderator Effects*

We used interaction models to test for a differential effect of involuntary job loss on subsequent smoking behavior. Differences by sex, socioeconomic status, and previous smoking quantity were investigated, as previous research has indicated varying effects for these variables [29, 37]. Our results, however, provide no evidence of a differential effect of job loss.

STATA software, version 8.0, was used to estimate all models. Where applicable, the data were weighted to adjust standard errors for the effects of household clustering (i.e., non-random selection of spouses).

## RESULTS

### Smoking Quantity

The results of the smoking quantity analysis are presented in Table 2. Once more, we present three models, the latter two of which reflect the addition of control variables and the conditioning on smokers at Wave 2 respectively. Model 1 represents the unadjusted association between involuntary job loss and subsequent smoking quantity, controlling only for baseline smoking quantity. Model 2 represents the association, after adjusting for relevant covariates, and Model 3 represents the same association, adjusted for covariates and restricting the sample to only those 999 individuals who continued smoking at Wave 2.

\*\*\*\* INSERT TABLE 2 NEAR HERE \*\*\*\*

The unadjusted findings (Model 1) suggest an association between involuntary job loss and Wave 2 smoking quantity, where the effect is motivated by one of the four subgroups of involuntary job losers. Involuntary job losers who remain unemployed at the Wave 2 survey report significantly higher daily cigarette consumption than individuals who do not experience job loss. The job losers who remained unemployed at follow-up reported smoking 7.09 ( $p < .01$ ) more cigarettes (according to Table 2), respectively, than individuals who did not experience job loss, even controlling for baseline smoking quantity. This effect is quite similar in magnitude with the inclusion of further control variables in Model 2.

Further conditioning on continued smoking indicates that, for this group, continued unemployment is associated with an increase in cigarette consumption of 4.97 ( $p < .05$ ) cigarettes relative to individuals who did not experience job loss. Ultimately, part of the effect of job loss on smoking quantity appears to operate through decreased cessation and, in part, through decreased quantity among continuing smokers.

### **Smoking Cessation**

The results of our analysis of the effect of involuntary job loss on the likelihood of smoking cessation are shown in Table 3. Both unadjusted (Model 1) and adjusted (Model 2) results are presented. Our findings do not indicate an association between involuntary job loss and smoking cessation. We were unable to assess the possibility that the effect of job loss on cessation varies by reemployment status after job loss, as the somewhat small number of job losers who later quit smoking precluded our disaggregating the measure of job loss. Nonetheless, although results are not conclusive due to sample size, they did suggest that those who were not reemployed had lower rates of cessation. Hence, when considering the effect of job loss on smoking quantity at Wave 2, it appears that part of the effect for those suffering a job loss with no reemployment operates through reduced cessation and part through increased quantity among continuing smokers.

\*\*\*\* INSERT TABLE 3 NEAR HERE \*\*\*\*

### **Smoking Relapse**

The results of the smoking relapse are presented in Table 4. For this outcome, we present unadjusted (Model 1), partially adjusted (Model 2), and fully adjusted (Model 3) models of the effect of involuntary job loss on smoking relapse.

Our findings suggest that involuntary job loss is positively related to a return to smoking among former smokers. The unadjusted and partially adjusted results indicate that job loss is associated with a roughly two and a half times increase ( $p < .05$ ) in the odds of smoking relapse between Wave 1 and Wave 2. After controlling for other covariates, the result is only slightly moderated, with the fully adjusted results indicating an odds ratio of 2.37 ( $p < .05$ ).

\*\*\* INSERT TABLE 4 NEAR HERE \*\*\*

### DISCUSSION

Somewhat contrary to earlier longitudinal studies of job loss, these results demonstrate that involuntary job loss among older workers is an important risk factor for both current and former smokers [36-38]. Among baseline smokers who did not quit by Wave 2, those in the job loss group who were not reemployed were found to be smoking five more cigarettes per day on average than those who did not suffer job loss. This difference persists after controlling for Wave 1 smoking quantity and other factors associated with smoking intensity, such as gender and heavy alcohol use. As smoking cessation is quite common for this sample, we show results for both continuing smokers and those including quitters. The implied net quantity difference for those who were not reemployed was over 7 cigarettes per day—a thirty percent increase over the baseline average. At a time in life when the health risks from smoking may be particularly detrimental, this is a potentially disastrous consequence of job loss.

Since the cessation process, itself, may be related to job loss, and would hence be non-random, we estimated models to assess the effect of involuntary job loss on smoking cessation likelihood. The results of this analysis suggests that a portion of the difference in smoking quantity between job losers who were not reemployed and those without a job loss was due to

differences in likelihood of cessation. This non-reemployed group was less likely to quit smoking at Wave 2, although due to small numbers we could not perform statistical tests on the differences for this group. As a combined group, however, job losers were not significantly less likely to quit smoking at Wave 2.

Certain stressors associated with job loss may be unique to those approaching retirement, perhaps explaining the lack of effect from other studies. Concerns about achieving adequate savings for retirement may be particularly salient for this group as studies have found that many older workers have inadequate savings for retirement [47]. Reemployment transitions are also likely to be particularly stressful for older workers. Yet, despite recent evidence linking inadequate and underemployment to depression [48], we did not identify any increased smoking among those in the reemployed group. Meanwhile, we found that among those who were *not* reemployed and did not retire, increases in quantity smoked were the highest. This is despite substantial financial difficulties. Based on descriptive analysis, we found that this group was the most likely to suffer a decline in assets of more than 25 percent between Waves 1 and 2.

While investigators often point to psychological stress as an important mediating effect between job loss and behavioral changes, other factors may also contribute to the relationship between involuntary job loss and smoking. For example, when an individual has been removed from the workplace environment, the elimination of such factors as smoking bans or peer behavior may make increased smoking more feasible. Similarly, the interruption of the balance between work-life and leisure may leave one with an overabundance of idle time that results in increased smoking.

Perhaps even more concerning are the effects of job loss on smoking relapse. Even though the average time since quitting among these older workers was over 16 years, relapse

rates are non-trivial (3.6%). Predicated rates based on the adjusted results from Table 4 imply relapse rates of 7.6% for the job loss group. These findings highlight the consequences of job displacement among older workers whose health behaviors may have been thought to be well established.

A clear advantage of this study is the ability to study the effects of involuntary job loss in a national sample of older workers rather than in a single plant closure. The overall survey size is large enough to track job loss among a representative group despite the somewhat low incidence of these events. Additionally, the prospective nature of the data allowed us to concentrate exclusively on those with a history of smoking and examine changes in behavior post job-loss. Although job loss is more common among smokers as a whole, tests for the endogeneity of job loss within the analytic samples of ever smokers ruled out the potential for reverse causation.

There are some potential limitations to the present study which we have attempted to address. Given the relatively small number of relapse cases among former smokers and the small number facing job loss, we lacked sufficient power to separately identify the effects of different types of reemployment or non-reemployment on relapse or cessation. Despite the potential for competing effects (as was seen in the smoking quantity results), the results remain surprisingly robust in the direction of job loss increasing relapse rates.

A separate issue is that smoking status and quantity are only assessed at two year intervals. We do not have information on changes in the intervening period, or on the timing of changes in smoking behavior relative to the job loss event. Another potential issue is that smoking status and quantity are assessed in this study through self-reports. While this is a limitation, other studies have shown self-reports are reliable [49, 50]. Additionally, since the

Health and Retirement Study was not focused on tobacco use, it is less likely that individuals would feel inclined to hide their smoking status.

Given the general range of questions included in this survey, the questions detailing smoking history are rather limited. For instance, information on number of quit attempts or use of pharmacological cessation aids is unavailable. However, a rich variety of controls ranging from disease onset to mental health status to drinking behavior and family and socioeconomic variables are available.

Since this sample is limited to older workers nearing retirement age, we are unable to analyze effect differences between older and younger workers or to calculate net effects for workers in general. Also, as our analysis of missing data revealed that several important explanatory variables may not be missing at random, the findings of this study may not be fully generalizable to the population of workers nearing retirement. Nevertheless, the present study focuses on a particularly interesting group of workers for whom job transitions may be particularly difficult and for whom behavioral change may be most damaging.

Given the general lack of consensus on the relationship between tobacco use and job loss in earlier studies [36-38], this study offers important evidence on job loss as a risk factor for smoking. This study offers clear support of a relationship between involuntary job loss and increased smoking behavior. It is also important to note that job loss is not a trivial risk factor. While the incidence rates of job loss and relapse appear low, the lifetime rates of these will be substantially higher.

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**Table 1** Descriptive characteristics of sample: full sample and analysis subsamples

	Ever smokers at baseline (N=3,052)	Current smokers at Wave 1 (n=1,203)	Former smokers at Wave 1 (n=1,849)
<b><i>Smoking Outcomes</i></b>			
Cessation at Wave 2	--	17.0%	--
Relapse at Wave 2	--	--	3.6%
Quantity Smoked at Wave 2	--	16.77 (13.62)	--
Quantity Smoked at Wave 2 (If Smoking at Wave 2)	--	20.19 (12.42)	15.22 (11.59)
<b><i>Job Loss Exposure</i></b>			
Involuntary job loss (IJL)	6.8%	7.8%	6.2%
IJL & reemployed full-time	2.7%	2.7%	2.7%
IJL & reemployed part-time	1.3%	1.8%	0.9%
IJL & not reemployed	1.5%	2.0%	1.2%
IJL & retired	1.3%	1.3%	1.4%
<b><i>Smoking History</i></b>			
Daily qty. of cigarettes at Wave 1	--	19.81 (12.60)	--
Quit smoking (no. of years)	--	--	16.17 (10.09)
<b><i>Other Covariates</i></b>			
Age in years	55.89 (3.58)	55.52 (3.49)	56.12 (3.62)
Female sex	39.3%	45.1%	35.5%
White race	82.2%	81.5%	82.6%
Married	77.5%	71.3%	81.5%
White collar occupation	66.8%	64.8%	68.2%
Moderate alcohol use	57.1%	53.5%	59.4%
Heavy alcohol use	6.1%	7.9%	4.9%
Baseline depression score (0-8)	0.55 (1.06)	0.67 (1.23)	0.47 (0.92)
Onset of cancer by Wave 2	1.4%	2.2%	0.8%
Onset of heart disease by Wave 2	2.3%	2.8%	2.0%
Spouse smoked at wave 1	22.2%	33.6%	14.8%

**Table 2** Effect of involuntary job loss on subsequent smoking quantity for wave 1 smokers, unadjusted and adjusted models

	Dependent variable: quantity of cigarettes smoked at Wave 2 (1994)		
	Unadjusted	Adjusted	Adjusted (wave2 smokers) <sup>a</sup>
	Model 1	Model 2	Model 3
	<i>Est. Coeff.</i> ( <i>Std. Error</i> )	<i>Est. Coeff.</i> ( <i>Std. Error</i> )	<i>Est. Coeff.</i> ( <i>Std. Error</i> )
n =	1,203	1,203	999
No Involuntary Job Loss (IJL)	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
IJL & reemployed full-time	.27 (1.58)	.01 (1.37)	-.18 (1.10)
IJL & reemployed part-time	1.08 (1.60)	1.58 (1.75)	.03 (1.28)
IJL & not reemployed	7.09** (2.53)	7.23** (2.32)	4.97* (2.38)
IJL & retired	-4.75 (4.05)	-4.36 (3.94)	1.44 (2.47)
Daily qty. of cigarettes at Wave 1	.64*** (.04)	.61*** (.04)	.59*** (.04)
Age in years		-.14 (.09)	-.13 (.08)
Female sex		-.97 (.63)	-1.53* (.62)
White race		1.96* (.79)	2.09* (.83)
Married		-1.44* (.72)	-1.30 <sup>+</sup> (.70)
Moderate alcohol use <sup>b</sup>		.92 (.65)	1.11 <sup>+</sup> (.65)
Heavy alcohol use <sup>b</sup>		5.01*** (1.38)	5.03*** (1.25)
Depressive symptoms score (CESD)		.08 (.25)	.16 (.25)
Onset of cancer by Wave 2		-6.89** (2.26)	-1.88 (2.95)
Onset of heart disease by Wave 2		-7.47*** (1.88)	-3.52* (1.76)
Constant	4.04*** (.70)	11.83* (5.17)	13.95** (4.91)

\*\*\* $P < 0.001$ , \*\* $P < 0.01$ , \* $P < 0.05$ , <sup>+</sup> $P < 0.10$ . IJL = involuntary job loss. <sup>a</sup>The sample size of Wave 2 continuing smokers is 999. <sup>b</sup>Comparison group is non-drinkers.

**Table 3** Effect of involuntary job loss on subsequent smoking cessation for wave 1 smokers, unadjusted and adjusted models

n = 1,203	Dependent variable: smoking cessation among current smokers by Wave 2 (1994)			
	Unadjusted Model 1		Adjusted Model 2	
	<i>OR</i>	<i>CI</i>	<i>OR</i>	<i>CI</i>
No Involuntary Job Loss (IJL)	<i>Ref.</i>		<i>Ref.</i>	
Involuntary Job Loss (IJL)	.76	(.40-1.45)	.74	(.37-1.48)
Daily qty. of cigarettes at Wave 1	.95***	(.93-.96)	.94***	(.92-.96)
Age in years			1.01	(.96-1.05)
Female sex			.78	(.56-1.09)
White race			1.01	(.68-1.51)
Married			1.23	(.84-1.78)
Moderate alcohol use <sup>b</sup>			1.05	(.76-1.45)
Heavy alcohol use <sup>b</sup>			.69	(.32-1.47)
Depressive symptoms score (CESD)			1.07	(.95-1.21)
Onset of cancer by Wave 2			6.19***	(2.70-14.20)
Onset of heart disease by Wave 2			3.80***	(2.02-9.09)

\*\*\* $P < 0.001$ , \*\* $P < 0.01$ , \* $P < 0.05$ , <sup>†</sup> $P < 0.10$ . IJL = involuntary job loss. <sup>b</sup>Comparison group is non-drinkers.

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**Table 4** Effect of involuntary job loss on subsequent smoking relapse, unadjusted and adjusted models

	Dependent variable: smoking relapse among former smokers by Wave 2 (1994)					
	Model 1		Model 2		Model 3	
	<i>OR</i>	<i>CI</i>	<i>OR</i>	<i>CI</i>	<i>OR</i>	<i>CI</i>
n = 1,849 <sup>a</sup>						
Involuntary Job Loss (IJL)	2.48*	(1.20-5.14)	2.44*	(1.17-5.08)	2.44*	(1.16-5.12)
Number of years since quitting			.97*	(.95-.99)	.98 <sup>+</sup>	(.95-1.00)
Age in years					.96	(.89-1.03)
White race					.85	(.45-1.62)
Married					.55 <sup>+</sup>	(.30-1.00)
Blue collar occupation					1.18	(.68-2.05)
Depressive symptoms score (CESD)					1.12	(.91-1.38)
Moderate alcohol use <sup>b</sup>					1.11	(.63-1.96)
Heavy alcohol use <sup>b</sup>					.58	(.12-2.76)
Spouse smoked at Wave 1					1.98*	(1.05-3.74)

\*\*\* $P < 0.001$ , \*\* $P < 0.01$ , \* $P < 0.05$ , <sup>+</sup> $P < 0.10$ . IJL = involuntary job loss. <sup>a</sup>The sample size of Wave 1 former smokers is 1,849.

<sup>b</sup>Comparison group is non-drinkers.