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ECON834 – HEALTH ECONOMICS

RESEARCH PAPER

THE EFFECTS OF STRESS ON SMOKING AND QUITTING BEHAVIOUR

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ABSTRACT

With increasing stress taking a toll on people's health in this modern world, it is relevant to access the impacts of stress on smoking and quitting behavior. In medical literature, stress is expected to influence people's smoking and quitting behavior. In heath economies literature, many kind of researche tend to find that this is the case. Hence, this paper sought to examine the literature concerning the effects of stress on smoking and quitting behavior.

1.0 INTRODUCTION

Many studies in the field of medical sciences have well-characterized cigarette smoking as an underlying cause of cardiovascular and respiratory diseases, obstructive pulmonary disease, depression and neoplasias. Each year, about 8 million deaths are tobacco-related (World Health Organization, 2019). An article published in Our world in Data by Hannah Ritchie and Max Roser in November 2019 reveals that in 2017, every seventh death in the world (13%) was the result of direct smoking and a further 2% was the result of secondhand smoke. This means that 15%, near 1-in-6, deaths that occurred were as the result of tobacco. A closer look at the breakdown of deaths from smoking by age in the article reveals that it is mainly older populations that are affected. The article also reveals that death rates from smoking are much higher in people older than 70 years old, followed by those aged 50 to 69. Death rates among younger adults and children are much lower. This is also revealed in the number of deaths by age in 2017 where just over half of the people who died prematurely from smoking were older than 70 years old, and close to 93% were 50 years and older. Due to some of these negative consequences, the decision to stop smoking

which is associated with many advantages is recommended. Although it is not yet clear whether stress influences smoking cessation or relapse from cessation attempts, there is a consensus in the literature that stress influences smoking behavior. Specifically, stress increases the likelihood of smoking and the amount of tobacco smoked by current smokers. This paper, therefore, attempts to review the literature about the effects of stress on smoking and quitting behaviours of smokers to aid in forming cessation policies.

A cigarette is a thin cylinder that contains psychoactive material, usually tobacco, and rolled into a paper for consumption through smoking. Cigarettes are ignited at one end, causing it to smolder and the resulting smoke is orally inhaled via the opposite end. Cigarettes are addictive because of its nicotine content. In this paper, the term cigarette refers to a tobacco cigarette and not to other substances, such as a cannabis cigarette. Further, I may use the term cigarette and tobacco interchangeably in this paper.

1.1 SMOKING INITIATION

Smoking is commonly initiated early in life. The age of smoking initiation is a significant element of an individual's probability of becoming addicted to tobacco, the probability of smoking cessation, and the risk of adversarial health outcomes. According to a paper by Burns DM, Lee L, Vaughn JW, et al (1995) on cigarette smoking in the US. It is revealed that cigarette compared with other forms of tobacco use, was a behaviour fundamentally limited to the 20th century and where initiation of cigarette smoking was essentially a male behaviour at the start of the century. A sharp rise in frequency of smoking in male adolescents ensued during the second decade of the century when mass marketing practices were applied to cigarette sales and the US militarised for World War I. In the 1920s and 1930s, due to the early efforts to target women with tobacco advertising in the US, there was a swift rise in the incidence of smoking in female adolescents.

Further, during World War II, there was an intense increase in the incidence of smoking for male adolescents in the US. However, the incidence of smoking among male adolescents declined precipitously beginning in the late 1940s and continuing through to 1980. This was in contrast to the incidence of smoking among female adolescents in the US which remained constant throughout the 1950s and early 1960s and rose at the very end of the 1960s and early 1970s. The rising rates for women were due to the targeting of young women through advertising promotions relating smoking with a slender female figure and the women's liberation movement. In conclusion, Burns DM, Lee L, Vaughn JW, et al (1995) found that smoking initiation in males in the US was between the ages of 14-17 whiles smoking initiation for females in the US was between the ages of 12-17. Marcon A, Pesce G, Calciano L, Bellisario V, Dharmage SC, Garcia-Aymerich J, et al. (2018) also evaluated the trends in smoking initiation between 1970 and 2009 (over 40 years) in random samples of European populations with data obtained from six multicentre studies associated with the Ageing Lungs in European Cohorts consortium. The data consisted of overall 119,104 subjects from 17 countries. After carrying out their analysis, it was found that smoking initiation during late adolescence, 16–20 years declined for both males and females in all regions of Europe except for South Europe. In South Europe, the decline in smoking initiation during late adolescence levelled off after 1990. But by the late 2000s, rates of smoking initiation during late adolescence were still high) in West, East and South Europe compared to North Europe. After 1990, in all regions except for North European males, smoking initiation rates during early adolescence (11–15 years) showed a noticeable increase. Hence, the authors conclude that smoking initiation is still unacceptably high among European adolescents, and increasing rates among those aged 15 or less merit attention.

Peltzer K. (2011) examined the common correlates and occurrence of early smoking initiation among male and female students in Africa. Using a total sample consisting of 17,725 students aged 13 to 15 years from nationally representative samples from seven African countries, it was found that, overall 15.5% of these school children had experienced smoking initiation before age 14, with males having a percentage of 20.1% and females having a percentage of 10.9%. Hence the study concluded that there was a high occurrence of early smoking initiation among 13–15 year-olds in the selected seven African countries.

Talip, T., Murang, Z., Kifli, N., Naing, L. (2016) systematically reviewed peer-reviewed articles on cigarette smoking initiation among Asian adolescents to be able to develop a conceptual model of factors influencing smoking initiation by incorporating all important factors based on existing data. The authors systematically reviewed 20 peer-reviewed articles published between 2005 and June 2015 on cigarette smoking initiation among adolescents living in Asia. They found that on average, cigarette smoking initiation age ranged between 10 to 14 years. Those who were more likely to initiate smoking were males, individuals with low parental education levels, older adolescents and low parental monitoring.

In the case of Canada, much research on smoking initiation indicates that most smokers begin smoking by age 19 (Health Canada 2000-2002 Report on Tobacco Control - An Update). Hence all the studies listed above are shreds of evidence to the claim that smoking is commonly initiated early in life.

1.2 PROFILE OF SMOKERS

According to an article by Hannah Ritchie and Max Roser on Our World in Data website, as of 2017, one-in-five (20%) adults in the world smoke tobacco. Daily smoking is most common across Europe and Asia where more than 20% of adults in most of the European and Asian countries

smoking every day. Further, 80 percent of these smokers live in low and middle income countries. Although it is reported that one-in-five adults in the world smoke tobacco, there are significant differences across sexes. Compared to over just 6 percent of women who smoke in the world, more than one-third (35 percent) of men in the world smoke. Examining all the countries in the world, it is true that in almost all countries more men smoke than women do with very large differences, particularly across Asia and Africa.

According to a report by the Center for Disease Control and Prevention (CDC), approximately 14 of every 100 U.S. adults aged 18 years or older (13.7 percent) smoked cigarettes in 2018. Implying that at the time an estimated 34.2 million adults in the United States smoked cigarettes in 2018 with men more likely to be current cigarette smokers than women. Nearly 16 of every 100 adult men (15.6 percent) smoked whiles about 12 of every 100 adult women (12.0 percent) smoked. Further, cigarette smoking was highest among people aged 25–44 years (nearly 17 of every 100 - 16.5%) and 45–64 years (nearly 16 of every 100 - 16.3%). Current cigarette smoking was lowest among people aged 18-24 years (nearly 8 of every 100 – 7.8%). Also, cigarette smoking was highest among non-Hispanic American Indians/Alaska Natives (nearly 23 of every 100 - 22.6%) and people of multiple races (about 19 of every 100 – 19.1%) and lowest among non-Hispanic Asians (about 19 of every 100 – 7.1%). Cigarette smoking was highest among people with a general education development certificate (36 of every 100 adults – 36.0%) and lowest among those with a graduate degree (nearly 4 of every 100 adults – 3.7%). Likewise, cigarette smoking was higher among people with a low annual household income (about 21 of every 100 adults with an annual household income less than $35,000 - 21.3%) than those with higher annual household incomes (about 7 of every 100 adults with an annual household income greater than $100,000 - 7.3%). Further, cigarette smoking was high among persons who were separated/divorced or

widowed (about 18 of every 100 - 18.1%) and lowest among those who were married/living with a partner (nearly 13 of every 100 – 12.5%). Smoking was highest in uninsured adults (nearly 24 of every 100 – 23.9%) and adults with Medicaid adults (nearly 24 of every 100 – 23.9%) and lowest in adults with Medicare only (about 9 of every 100 – 9.4%). Finally, adults who had experienced serious psychological distress were more likely to be current smokers (32 of every 100 - 31.6%) than adults who did not report serious psychological distress (13 of every 100 - 13.0%).

Turning my attention now to the profile of cigarette smokers in Canada based on a report from Statistics Canada. In 2018, a percentage of 15.8 Canadians aged 12 and older (approximately 4.9 million people) smoked cigarettes either occasionally or daily. Among males and females, the number of current smokers for 2018 was 18.6 percent for males and 13.0 percent for females. Across all age groups, smoking was least common among youth aged 12 to 17 (3.2 percent). Of the 4.9 million current smokers, 3.4 million were daily cigarette smokers. The bulk of current non-smokers were lifetime abstainers, having never smoked a whole cigarette. Just over one in five Canadians (21.3 percent) in 2018 were current non-smokers who used to be daily smokers. Also, individuals typically begin smoking during their teenage years. However, in 2018, 62.6 percent of those aged 20 to 24 had never smoked a whole cigarette. Within this age group, the proportion of never smoking was higher for females (70.2%) than for males (55.9%). Further, the percentage of residents who smoked daily or occasionally was lower than the national average (15.8%) in British Columbia (12.0%) and was higher than the national average in Saskatchewan (20.1%), Nova Scotia (18.0%) and Quebec (17.5%). The percentage of residents who smoked daily or occasionally was about the same as the national average in all other provinces.

2.0 REVIEW OF LITERATURE

This chapter is divided into two parts. The first of this chapter part reviews the existing literature in economics with regards to job stress and its impacts on smoking and quitting behaviour. The second part reviews the existing literature in economics with regards to any other stress apart from job stress and its impacts on smoking and quitting behaviour.

2.1 REVIEW OF THE LITERATURE REGARDING JOB STRESS AND SMOKING AND QUITTING

Studies that mainly modelled differential responses to job stress only by observed characteristics have generated highly variable outcomes examining the effects of job stress and its impacts on smoking and quitting behaviour. Testing methodologies have also varied in the research. Many studies have employed logistic regression analysis and latent class regression modeling. Others have implemented Ordinary Least Square modelling to analyze smoking status (current smokers versus non-smokers, and a more restricted analysis of current smokers versus former-smokers) and daily smoking intensity outcomes concerning job stress measures. However, the similar characteristics of these studies are mainly the use of a cross-sectional population-based survey data.

Using Ordinary Least Square modelling, Ayyagari and Sindelar (2010) presented an analysis of the impact of job stress on the likelihood for smokers to quit smoking (smoking status) and the number of cigarettes smoked for current smokers (intensity of smoking). The research uses data obtained from the 1992 to 2004 Health and Retirement Study (HRS), a nationally representative longitudinal survey of individuals over 50 years and their spouses in the US. To carry out this analysis, an ordinary least squares regression equation was estimated with smoking (smoking status and intensity of smoking) as the dependent variable and job stress, observable characteristics, unobserved occupation and time effects as the independent variables. Smoking

status represented a binary indicator of whether or not a person smokes at the time of data collection and intensity of smoking as represented by the number of cigarettes that a smoker smoked in a day. Job stress variable was measured with the question of how much responders agreed or disagreed with the statement "My job involves a lot of stress". A value of 1 was assigned if the responder reported that they strongly agreed and zero otherwise. Furthermore, a second model (FE-fixed effect model) that accounted for the unobserved time-invariant individual-specific factors such as preferences that affect both smoking decisions and job stress was estimated. The researchers found in their analysis that job stress is positively and significantly associated with continuing to smoke and to the number of cigarettes smoked for current smokers (that is job stress positively impacts the smoking status and the intensity of smoking for smokers in the OLS and FE regressions).

By applying logistic regression analysis, Azagba and Sharaf (2011); Radi, Ostry and LaMontagne (2007); Kouvonen, Kivimäki, Virtanen, et al (2005); Cui, Rockett, Yang and Cao (2012) and Kim, Chae, Park et al (2019) studied the impact of stress on smoking and quitting behavior. Azagba and Sharaf (2011) used data from the Canadian National Population Health Survey to examine the effect of job stress on smoking behaviour for at least two "types" of individuals (light cigarette users and heavy cigarette users according to an individual's latent status). The latent class model (LCM) was used to capture population unobserved heterogeneity, and whether there are differences in behavioral responses to job stress was examined. Karasek's job strain model (high job demands and low job control) was used to measure job stress in this study. The researchers began their analysis by using conventional econometric models (OLS, Poisson, and negative binomial) to estimate a reduced-form model that examined the relationship between job stress and cigarette smoking. The results from the traditional econometric models with average population

estimates for the effect of job stress on cigarette consumption were not significantly different between the OLS and the Poisson and negative binomial models. The results from these conventional econometric models found that that high job strain had a positive and significant effect on smoking intensity compared to low job strain. Next, the latent class model was used to examine whether there exists a differential health behavior response to job stress that splits the population into subpopulations of light or heavy smokers. The results from the latent class model indicated that a large group (over 70%) are light smokers and the effect of high job stress is significant and positive for this group. Hence the results supported the presence of at least two distinct latent classes of smokers (light cigarette users and heavy cigarette users) with light users being the most vulnerable group. This implied that job stress had a statistically significant and positive and impact on smoking intensity for light smokers.

Radi, Ostry and LaMontagne (2007) assessed the relationships between current smoking status and job stress and other working conditions. The researchers used a cross-sectional survey dataset of working Australians to conduct logistic regression modelling for smoking status and daily smoking intensity outcomes concerning job stress measures and other independent variables. The smoking status represented a variable of current smokers versus non-smokers, and current smokers versus former-smokers. The demand/control, job pressure and effort/reward imbalance (ERI) models were used to measure job stress. To carry out the analysis, bivariate analyses were done using chi-square tests for categorical variables with quantitative variables expressed as means. Multiple logistic regression was used to measure the effect of various combinations of independent variables on smoking status. Analysis of covariance was used to compute adjusted mean daily cigarette consumption and categorical variables with more than two categories included in models as dummy variables. The researchers found in their analysis that high job stress was observed to

be positively associated with current smokers as compared to non-smokers and former smokers for men in high stress jobs, moderate job pressure and long working hours, and in women for active jobs and physical activity at work. However, over-commitment in men and high stress jobs for women were associated with decreased odds of current smoking. That is high stress jobs were associated with diminished odds of current smoking compared to former smoking in women. These results taken together indicated that job stress was related to smoking status at the population level, with different patterns in women and men.

Kouvonen, Kivimäki, Virtanen, et al (2005) used a dataset containing the survey responses of 37309 female and 8881 male Finnish public sector employees aged 17–65 to examine the association between work stress (as indicated by the effort-reward imbalance model and the job strain model) and smoking. The researchers employed multinomial logistic regression models to study the relation between work stress indicators and smoking intensity. Binary logistic regression models were used to calculate adjusted odds ratios (ORs) and their 95% confidence intervals (CIs) for ex-smoking and smoking status according to work stress indicators. Adjustments were also made for age, basic education, occupational status, type of employment, and marital status by the researchers in this study. Work stress and effort-reward imbalance were additionally controlled for each other and the associations between work stress indicators and smoking were tested to check whether they were independent of sex and occupational status. The results from these analyses indicated that the effort-reward imbalance was associated with prevalent smoking. The odds of being a smoker were 1.13-fold higher among men and 1.28-fold higher among women with high effort-reward imbalance compared with male and female employees with low effort-reward imbalance, respectively. This implied that low rewards were related with an increased likelihood of being a smoker. However, it was found that neither job stress nor any of its components was

significantly related with smoking status. Focusing on the relationship between work stress and smoking intensity, it was found that there was a significant relation between the two work stress models (high job strain and high effort-reward imbalance) and intensity of smoking in women (increased likelihood of smoking 20 cigarettes or more per day for job strain and increased likelihood of smoking 10–19 cigarettes per day for effort-reward imbalance). Hence the researchers conclude that this serves as evidence to suggest that there exists an association between work stress and smoking implying that smoking cessation programmes and policies may profit from taking into account the alteration of stressful features of work environs.

Although the methods employed by the papers above are fit for their purposes, the conclusions arrived at with these methods should be taken with caution. This is because regression models assume that the relationship between the independent variables and the dependent variable is uniform which may be positive or negative, linear or nonlinear but is constant over the entire range of values. This assumption may not hold true for numerous associations. Furthermore, regression equations derived from a specific set of subjects in one country may not apply to subjects in a different country with different characteristics. However, regardless of the methods, the above studies somewhat suggest that job stress impacts smoking behaviour. It is also evidenced that other forms of stress apart from job stress may impact the decision to smoke tobacco or quit. These literatures are reviewed in the second part of this chapter.

2.2 REVIEW OF THE LITERATURE REGARDING OTHER KINDS OF STRESS AND SMOKING AND QUITTING

Apart from job stress, other sources of stress that may increase the likelihood of individuals to consume tobacco products. Hence, it is important to study the association between these other sources of stress and its impact on the smoking behaviour of individuals. Findings could inform

health policy, and help shape the design and implementation of effective tobacco control strategies among these highly vulnerable individuals.

Employing a multi-stage systematic sampling method to recruit participants, Cui, Rockett, Yang and Cao (2012) studied the relationship between life stress and its association with smoking among rural–urban migrant workers in China. The researchers employed multiple logistic regression and Chi-square test analysis using two models. The first model was the full model that comprised the stress variables as well as socio-demographic and migration-related characteristics. The second model emphasized on a particular stress variable as appropriate for the study. Furthermore, the Chi-square tests were employed to compare the proportions of smokers between groups. Multiple logistic regression analyses were conducted to evaluate respective relations between smoking behavior and socio-demographic, migratory, geographic, and stress characteristics of study participants. Also, a design weight based on the random selection steps in the multistage sampling design was used in the analysis. Of the 1,595 participants used in the study, it was found that under the first model that migrants with high perceived life stress showed a 45% excess possibility to be current smokers compared to low-stress counterparts. According to the researchers, this finding epitomizes the excess prevalence of smoking and stress among rural–urban migrants in China, and in the process discloses a very important and interconnected social and public health issue. These results reinforces observations that stress is a risk factor for smoking. Further, the researchers go on to observe that several studies suggested that Chinese rural–urban migrants have excess smoking prevalence and that these smoking behaviors was related to high stress, however, this research revisited this question from a broader perspective. This observation is far different from what I observed because this study seems to examine the relationship between smoking behaviors and stress from the same perspective as other studies listed as references for this particular study.

Also, the strength of this study as the researchers observed is that instability of both living and employment was both factored into the life-stress component in contrast to previous studies that have shown that the prevalence of smoking initiation intensifies with unstable living conditions. The researchers conclude that their results back the need for the formation and implementation of policies and strategies that addresses smoking problems through intervention in both stress and smoking pathways.

Using the existence of self-reported stress in the daily lives of individuals as a dependent variable, Kim, Chae, Park et al (2019) study in the impact of smoking cessation attempts on stress level using a data of 488,417 participants of the Korean Community Health Survey (2011–2016). The researchers used a chi-square test and logistic regression to analyze the data obtained. Although the variables of interest were stress levels and smoking cessation behavior (measured by the combination of two questions "Are you a current smoker?" and "Have you ever tried to quit smoking further than 24 hours?"). Independent variables such as family members, marital status, education level, age, gender, family income, job, alcohol use, self-reported health, underlying chronic disease, and survey year were included in the analysis. Further, analyses were done on a fully adjusted model with all subjects and then on a fully adjusted model stratified by sex. Additional analyses were conducted on further levels of stress: low, mid and high, by sex. The results from these analyses indicated that 78.3% (63.3% males, 81.4% females) of the subject population felt stressed. Further, 73.0% (72.6% males, 78.1% females) of the individuals among participants who successfully stopped smoking reported feeling stressed. In contrast, 83.3% (83.6% males, 86.3% females) of participants who failed to stop smoking reported high stress levels. Also, 81.1% (81.2% males, 80.3% females) of the participants who did not attempt to stop smoking responded that they experienced stress. According to this study, further analysis showed

that participants who failed to stop smoking had higher odds of stress than those who did not attempt to stop smoking. Further, participants who successfully stopped smoking had lower odds of stress than those who did not attempt to stop smoking. The strength of this research work lies in the fact that it uses a direct measure for stress (a self-reported measure). However, the weakness of the study is the failure to employ statistical analysis to check if the reported association between daily stress and smoking behaviour was influenced or could be explained by the other heterogeneous variables. This weakness is painfully highlighted as the researchers conclude that they found an association between unsuccessful smoking cessation and stress level.

3.0 CONCLUSION

Smoking has been associated with serveral public health concerns whose outcomes include respiratory diseases. Hence the decision to quit smoking is largely encouraged. However, many smokers struggle to quit. Amongst the reasons why smokers struggle to quit smoking is stress. It is widely believed that stress increases the likelihood of smoking initiation and the amount smoked by current smokers. Although some research works have shown to a degree the impact of stress has on smoking and quitting behavior. Others too have found such no impact. This paper tried to do a critical review of the literature with regard to the impact of stress on smoking and quitting behavior. The paper starts by elucidating the process of smoking initiation and providing some worldwide demographic information about smokers. Then some literature was provided with concerning previous researches which aimed to study the impact of stress on smoking and quitting behavior. This was done in two parts; first by reviewing the impact of job stress on smoking and quitting behavior, and second, by reviewing the impact of all other stress apart from job stress on smoking and quitting behavior. Finally, this topic is relevant to write a paper on because there may be an opportunity to draw economic lessons from this it.

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