Original Investigation

Socioeconomic position and abrupt versus gradual method of quitting smoking: Findings from the International Tobacco Control Four-Country Survey

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Abstract

Introduction: Our aim was to investigate the association between socioeconomic position (income and education) and abrupt versus gradual method of smoking cessation.

Methods: The analysis used data ($n = 5,629$) from Waves 1 through 6 (2002–2008) of the International Tobacco Control Four-Country Survey, a prospective study of a cohort of smokers in the United States, Canada, the United Kingdom, and Australia.

Results: Logistic regression analyses using generalized estimating equations showed that higher income ($p < .001$) and higher education ($p = .011$) were associated with a higher probability of abrupt versus gradual quitting. The odds of adopting abrupt versus gradual quitting were about 40% higher among respondents with high income (\$60,000 and more in the United States/Canada/Australia and £30,000 and more in the United Kingdom) compared with those with low income (less than \$30,000 in the United States/Canada/Australia; £15,000 and less in the United Kingdom). Similarly, the odds of abrupt versus gradual quitting were about 30% higher among respondents with a high level of education (university degree) compared with those with a low level of education (high school diploma or lower).

Discussion: Higher socioeconomic position is associated with a higher probability of quitting abruptly rather than gradually reducing smoking before quitting.

Introduction

Smoking cessation can be done either abruptly (going from regular consumption level to quitting completely) or gradually (reducing the number of cigarettes smoked before quitting).

Abrupt cessation is more prevalent than gradual cessation in many countries (Cheong, Yong, & Borland, 2007; Doran, Valenti, Robinson, Britt, & Mattick, 2006; Hughes, 2007; Myers & MacPherson, 2004; Sieminska et al., 2008). For example, in the 2005 Vermont Adult Tobacco Survey in the United States, 65% of smokers who tried to quit in the last year tried abrupt quitting (Hughes). According to the 2004 wave of the International Tobacco Control (ITC) Policy Four-Country Survey, between two thirds and three fourths of smokers in the United States, Canada, the United Kingdom, and Australia adopted abrupt quitting in their last quit attempt (Cheong et al.). Many cessation programs, as well as the U.S. Clinical Practice Guidelines, recommend that smokers quit abruptly by deciding on a quit date within 2 weeks and maintaining complete abstinence following the quit date (Fiore et al., 2008). The Guidelines do not recommend reduction before a quit date. The rationale behind discouraging smokers from adopting gradual cessation is that this method makes each remaining cigarette more rewarding and more difficult to give up. Furthermore, during this process, the smoker may lose motivation before reaching the point of total abstinence (Lindson et al., 2009).

While some randomized trials indicate that abrupt versus gradual method of quitting results in similar or less favorable cessation rates (Cinciripini et al., 1995; Cummings, Emont, Jaen, & Sciandra, 1988; Flaxman, 1978; Gunther, Gritsch, & Meise, 1992), observational studies suggest that abrupt quitting leads to an improvement in cessation rates (Cheong et al., 2007; West, McEwen, Bolling, & Owen, 2001). A trial conducted by Cinciripini et al. (1995) evaluated abstinence at 1 year after cognitive-behavioral relapse prevention training and a 3-week period of (a) scheduled reduced smoking (progressive increase in inter-cigarette interval), (b) nonscheduled reduced smoking (gradual reduction and no specific change in the inter-cigarette interval), (c) scheduled nonreduced smoking (fixed inter-cigarette interval and no reduction in frequency), or (d) nonscheduled

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nonreduced smoking (no change in inter-cigarette interval or smoking frequency). Abstinence rates were 44%, 18%, 32%, and 22%, respectively, indicating that scheduled reduction was the most effective method followed by abrupt quitting and non-scheduled reduction. Gunther et al. compared 1-year abstinence rates between two groups of subjects who were assigned to abrupt and gradual quitting. Depending on the initial consumption, gradual quitters were asked to reduce smoking by 5–10 cigarettes per week. The results showed no difference in abstinence between the two groups. Cummings et al. compared cessation outcomes between a group that received instructions to quit abruptly and a group who was instructed to gradually reduce the number of cigarettes smoked (e.g., by setting daily goals for reduction by or delaying the first cigarette of the day) over a brief period before quitting. One-month cessation rate was similar between the groups, and 6-month cessation rate was slightly higher in the gradual than the abrupt quitting group. An observational study in the United Kingdom by West et al. reported that the odds of successful quitting were 70% larger for abrupt versus gradual quitters, which was defined as smokers who had “cut down . . . as a first step to cessation” before their quit attempt. A larger effect of abrupt quitting was reported by Cheong et al., using the ITC Four-Country Survey data. The authors defined gradual quitting as “gradually cut[ting] down the number of cigarettes” in the most recent quit attempt. There has been debate over whether or not the increased success among abrupt quitters shown in observational studies is due to their greater motivation to stop smoking (Hughes, 2007). However, recent evidence shows that abrupt quitters are not more likely to have an intention to quit nor are they more likely to have more confidence in their ability to quit (Cheong et al.; Hughes).

To our knowledge, only two studies have compared the characteristics of smokers who tried to quit abruptly versus gradually. Hughes (2007) reported no difference in education, age, gender, minority status, intention to quit, age of onset of smoking, or nicotine dependence between abrupt and gradual quitters. However, Cheong et al. (2007) found that compared with gradual quitters, abrupt quitters were more likely to be younger, male, and heavy smokers and have a lower perceived dependence. They also found some evidence that higher income was associated with a higher probability of adopting the abrupt versus gradual method, although they found no association with education. Their analysis employed data from Waves 2 and 3 of the ITC Four-Country Survey and used regression modeling separately for each wave. The aim of the present study was to extend the work of Cheong et al. by taking advan-

tage of the longitudinal nature of the survey and developing a unified regression model with six waves of data to investigate the association of socioeconomic position with abrupt versus gradual quitting.

Methods

Data

Data came from Waves 1 through 6 (2002–2008) of the ITC Four-Country Survey. A detailed description of the survey methodology can be found elsewhere (Thompson et al., 2006; also see <http://www.itcproject.org>). Briefly, the ITC Four-Country Survey is a prospective cohort study designed to evaluate the psychosocial and behavioral impact of key national-level tobacco control policies enacted in the United States, Canada, the United Kingdom, and Australia. All aspects of the study protocol and survey measures are standardized across the four countries. Data collection is based on telephone interviews of a probability sample of smokers, with approximately 2,000 smokers per country in each wave. Respondents lost to follow-up are replaced at each wave using the same sampling frame.

The present study included all respondents who had reported to have made a quit attempt since the previous wave and who smoked at least 5 cigarettes/day per day at the previous wave. Table 1 shows the number of respondents in each wave included in the analysis. The overall attrition rates were 25.3%, 31.3%, 28.6%, 30.9%, and 28.8% in Waves 2, 3, 4, 5, and 6, respectively.

The study protocol was cleared for ethics by the Institutional Review Boards or Research Ethics Boards in each of the countries included in the study by the following institutions: the University of Waterloo (Canada), Roswell Park Cancer Institute (United States), University of Illinois-Chicago (United States), University of Strathclyde (United Kingdom), and the Cancer Council Victoria (Australia).

Outcome

All respondents in Waves 2 through 6 who had made a quit attempt (i.e., had “tried to quit smoking”) since the previous wave were asked to characterize their most recent attempt (or their only attempt, if they had made only one attempt since the previous wave), with the question: “Did you stop smoking suddenly or did you gradually cut down on the number of cigarettes you smoked?”

Table 1. Weighted percentage of smokers who tried to quit abruptly (among those who attempted to quit) in the last quit attempt by wave by country

	Wave 2 (<i>n</i> = 1,944)	Wave 3 (<i>n</i> = 1,993)	Wave 4 (<i>n</i> = 2,076)	Wave 5 (<i>n</i> = 1,804)	Wave 6 (<i>n</i> = 1,816)
United States	67.6	68.7	70.4	68.5	59.1
Canada	64.7	68.2	68.1	66.5	65.9
United Kingdom	73.9	71.8	77.0	74.3	75.3
Australia	69.2	72.0	74.6	70.8	78.1
Total	68.8	70.2	72.9	70.1	70.3

Note. A given respondent might have participated in more than one wave. Thus, the sum of the sample sizes across waves is larger than the number of respondents used in the multivariate analysis.

Predictors

All predictors were measured at each wave of the data collection, except income and education at Wave 2, where Wave 1 values were carried over.

We used *income* and *education* as indicators of socioeconomic position. Annual household income was categorized into “less than \$30,000” (low), “\$30,000–59,999” (medium), and “\$60,000 and more” (high) for the United States, Canadian, and Australian samples. For the U.K. sample, the following categories were used: “£15,000 or less,” “£15,001–30,000,” and “£30,001 and more.” Level of education consisted of three categories: high school diploma or lower (low); technical, trade school, community college, or some university (medium); and university degree (high).

Age, gender, ethnicity, and country were included in the analyses as control variables. A host of smoking-related variables were also included. *Cigarettes per day* was measured by asking respondents about their average daily cigarette consumption. *Minutes to first cigarette* was based on the question “How soon after waking do you usually have your first smoke?” *Perceived ease/difficulty of quitting* was measured with the question “How easy or hard would it be for you to quit smoking if you wanted to?” with five response options ranging from “1 = very easy” to “5 = very hard.” *Having an intention to quit* (yes/no) was based on the question “Are you planning to quit smoking . . . within the next month, within the next 6 months, sometime in the future, beyond 6 months, or are you not planning to quit?” and respondents who were planning to quit within the next 6 months were identified as having an intention to quit. *Self-efficacy to quit* was measured with the question “If you decided to give up smoking completely in the next 6 months, how sure are you that you would succeed?” with five response options ranging from “1 = not at all sure” to “5 = extremely sure.” *Overall opinion of smoking* was based on the question “What is your overall opinion of smoking?” with five response options ranging from “1 = very positive” to “5 = very negative.” *Worries about health and quality of life* were the sum of scores on two variables (Cheong et al., 2007): “How worried are you, if at all, that smoking will lower your quality of life in the future?” and “How worried are you, if at all, that smoking will damage your health in the future?” Each question had four response options ranging from “1 = not at all worried” to “4 = very worried.” *Use of stop-smoking medication* (yes/no) was measured with the question “since [the last survey date] have you used any stop-smoking medication?” *Use of quitline services* (yes/no) was based on the question “Since [the last survey date] have you received advice or information about quitting smoking from telephone or quitline services?”

Statistical analysis

Weighted data were used to compute point estimates. Logistic regression was employed to examine the effect of predictors on adopting abrupt versus gradual quitting, with modeling done in two stages. In the first stage, bivariate regressions were performed for all predictors. The predictors with *p* values less than .05 were then entered into the second stage of modeling to estimate a multiple regression equation. Cases with missing values for any of the study variables in any wave of the study were excluded from the analysis. The variable with the largest proportion of missing data was income, about 6% in each wave.

Supplementary analysis indicated that including missing data as a separate category in the regression models did not change the results appreciably. In order to take into account the correlated nature of the longitudinal data, we used generalized estimating equations (GEE) to compute parameter estimates (Liang & Zeger, 1993). Our large sample size allowed us to assume an “unstructured” correlation structure in GEE. We used robust variance to compute the *p* values for the parameter estimates (Hanley, Negassa, Edwardes, & Forrester, 2003).

In logistic regression analyses, the following variables were measured in the wave prior to the wave in which abrupt quitting was measured: income, education, cigarettes per day, minutes to first cigarette, perceived ease/difficulty of quitting, having an intention to quit, self-efficacy to quit, perceived benefits of quitting, overall opinion of smoking, and worries about health and quality of life. The following variables were measured in the same wave as that of abrupt quitting: age, gender, ethnicity, country, use of stop-smoking medication, and use of quitline services.

Overall, 5,629 respondents were included in the analysis, of whom 3,850 contributed data to one wave, 822 contributed data to two waves, and 957 contributed data to three or more waves. In total, 8,208 person-wave observations were included in the final regression model. All analyses were conducted using Stata 10 SE (StataCorp, 2007).

Results

The overall weighted incidence of any quit attempt was 36.8%, 41.3%, 41.0%, 38.39%, and 37.4%, in Waves 2, 3, 4, 5, and 6, respectively. Table 1 shows weighted percentages of smokers who tried to quit and who quit abruptly in their most recent quit attempt by each country in each wave of data collection. Overall, approximately two thirds of smokers who tried to quit adopted abrupt quitting across countries and waves.

Table 2 provides both crude and adjusted odds ratios for the association of socioeconomic position and abrupt quitting. Adjusted results showed that higher income ($p < .001$) and higher education ($p = .011$) were associated with a higher probability of abrupt versus gradual quitting. The odds of adopting abrupt quitting were about 40% higher among respondents with high income (\$60,000 and more in the United States/Canada/Australia or £30,000 and more in the United Kingdom) compared with those with low income (less than \$30,000 in the United States/Canada/Australia or £15,000 or less in the United Kingdom). Similarly, the odds of abrupt versus gradual quitting were about 30% higher among respondents with a high level of education (university degree) compared with those with a low level of education (high school diploma or lower).

Smokers who were younger (<40 years), male, or White/English speaking had a higher probability of abrupt versus gradual quitting than those who were older (≥ 40 years), female, or non-White/English speaking, respectively. Smokers in Canada were least likely to quit abruptly, followed by those in the United States, Australia, and the United Kingdom. Greater perceived difficulty in quitting was associated with a lower probability of abrupt versus gradual quitting. Use of stop-smoking medication and quitline services for smoking

Table 2. Odds ratios for the association of socioeconomic position and other predictors with abrupt quitting in last quit attempt

	Crude OR (95% CI)	p value	AOR (95% CI)	p value
Income		<.001		<.001
Low	1.0		1.0	
Medium	1.3 (1.1–1.4)		1.2 (1.0–1.3)	
High	1.6 (1.4–1.8)		1.4 (1.2–1.6)	
Education		<.001		.011
Low	1.0		1.0	
Medium	1.1 (1.0–1.2)		1.1 (1.0–1.3)	
High	1.3 (1.2–1.6)		1.3 (1.1–1.5)	
Age (years)		<.001		.004
18–24	1.0		1.0	
25–39	1.2 (1.0–1.5)		1.2 (1.0–1.4)	
40–54	1.0 (0.8–1.2)		0.9 (0.8–1.1)	
55+	1.0 (0.8–1.2)		0.9 (0.8–1.1)	
Gender		<.001		.003
Male	1.0		1.0	
Female	0.8 (0.7–0.8)		0.8 (0.8–0.9)	
Ethnicity		<.001		<.001
White/English speaking	1.0		1.0	
Other	0.7 (0.6–0.8)		0.7 (0.6–0.8)	
Country		<.001		<.001
US	1.0		1.0	
Canada	1.0 (0.9–1.2)		1.0 (0.8–1.1)	
UK	1.6 (1.4–1.8)		1.6 (1.4–1.9)	
Australia	1.4 (1.2–1.6)		1.3 (1.2–1.5)	
Cigarettes per day		.186		—
5–10	1.0		—	
11–20	1.1 (1.0–1.2)		—	
21–30	1.1 (1.0–1.3)		—	
>30	1.2 (1.0–1.6)		—	
Minutes to first cigarette		.059		—
>60	1.0		—	
31–60	1.0 (0.8–1.2)		—	
6–30	0.9 (0.8–1.0)		—	
<5	0.9 (0.7–1.0)		—	
Ease/difficulty of quitting	0.9 (0.9–1.0)	<.001	0.90 (0.9–0.9)	<.001
Having intention to quit	1.1 (1.0–1.2)	.115	—	—
Self-efficacy	1.0 (1.0–1.0)	.918	—	—
Perceived benefits of quitting	1.0 (1.0–1.0)	.942	—	—
Overall opinion of smoking	1.1 (1.0–1.1)	.034	1.1 (1.1–1.1)	.064
Worries about health and QOL	1.0 (1.0–1.0)	.130	—	—
Used stop-smoking medication	0.9 (0.8–1.0)	.015	0.9 (0.8–1.0)	.003
Used quitline services	0.8 (0.7–1.0)	.015	0.8 (0.6–0.9)	.008

Note. AOR = adjusted odds ratio; OR = odds ratio; QOL = Quality of Life.

cessation was both associated with a lower probability of abrupt versus gradual quitting.

In analyses not shown here, we found that wave of recruitment and length of time a respondent was in the sample were not associated with abrupt quitting. Furthermore, the number of datapoints a respondent contributed to the analysis (i.e., the number of waves of data collection that a respondent reported having made a quit attempt) was not associated with the outcome. There were no interactions between income or education and country or any other covariate.

Discussion

Analysis of six waves of longitudinal data from the United States, Canada, the United Kingdom, and Australia revealed that higher socioeconomic position is associated with a higher probability of adopting abrupt versus gradual smoking cessation.

Considering that there is some evidence that abrupt quitting is associated with better cessation outcomes (Cheong et al., 2007; West et al., 2001) than gradual quitting, studying the predictors of abrupt quitting as was done in this research may help us to gain a better understanding of why certain sociodemographic groups are not as successful in quitting as others. Greater use of cutting down might be a reason why smokers from more disadvantaged socioeconomic backgrounds are sometimes found to have less success in quitting (Fernandez et al., 2006; West et al.) and why sometimes females are found to be less successful than males (Bjornson et al., 1995; Wetter et al., 1999).

We note that our study used a self-reported measure of gradual quitting. Respondents were asked whether they stopped smoking suddenly or gradually reduced the number of cigarettes they smoked. Similar measures have been employed in the studies that have shown that the gradual method is associated with a lower cessation rate than the abrupt method (Cheong et al., 2007; West et al., 2001). On the other hand, many of the studies that have reported the gradual method to be associated with a higher cessation rate define this method as substantial reduction in the number of cigarettes smoked over a specified period of time. For example, in trials conducted by Cinciripini et al. (1994, 1995), they defined scheduled reduction as reducing baseline cigarette consumption by a factor of one third in the first week and an additional reduction of one third of the baseline consumption in the second week. In the third, that is, the final week, the number of cigarettes per day was reduced every 2 days by a factor of one third of the previous day. It is plausible that discrepant findings about the cessation outcomes of gradual versus abrupt method are due to how gradual quitting is defined.

Our analysis showed that prior intention to quit and self-efficacy to quit were not associated with abrupt versus gradual quitting, suggesting that motivation is not a contributing factor to why gradual quitters are sometimes shown to be less successful in quitting and contributing to the debate in this area. Our results are consistent with a study conducted by Hughes (2007) who asked the following question from a group of current smokers who had tried to quit in the past year: "In your most recent attempt to stop smoking, did you quit smoking gradually or abruptly?" The study showed no difference between abrupt

and gradual quitters in terms of their intention to quit in the next 1 month or next 6 months or confidence in their ability to quit. Our finding, however, was not consistent with report of Peters, Hughes, Callas, and Solomon (2007) that compared with smokers whose goal was to quit gradually, those whose goal was to quit abruptly had a higher score on an index of readiness to quit in the near future. A possible reason for this inconsistency may be that both our study and Hughes' study inferred motivation from reports about intention to quit and self-efficacy to quit, while Peters et al.'s report inferred motivation from behavior over the next 30 days (Hughes).

Our analysis showed that smokers who call a quitline or use stop-smoking medication for help in quitting are less likely to quit abruptly. This is surprising given that official recommendations, such as the U.S. Clinical Practice Guidelines (Fiore et al., 2008), suggest that smokers who want to quit should do so abruptly. Similarly, instructions for the use of nicotine replacement therapies indicate that they should not be used when the user is still smoking but as soon as the smoker smokes his/her last cigarette (Rose, Behm, Westman, & Kukovich, 2006). Also, the smoking cessation clinics within the U.K.'s National Health System (McNeill, Raw, Whybrow, & Bailey, 2005) recommend abrupt quitting and provide help to smokers who adopt this method. More research needs to be done on why users of stop-smoking medications and quitlines are more likely than others to adopt gradual versus abrupt quitting. It is worth noting that Cheong et al. (2007) found that smokers who adopted gradual quitting were more likely to successfully quit if they also used stop-smoking medication, which may suggest that some experimentation with the use of stop-smoking medication while cutting down on smoking may in fact be beneficial.

Our findings regarding the association of abrupt quitting with sociodemographic characteristics (education, age, gender, and race/ethnicity) were inconsistent with Hughes' (2007) who found no association. Our results indicated that individuals who were less than 40 years old, male, or White/English speaking were more likely to adopt abrupt versus gradual quitting. A possible reason for the discrepancy is that our research had higher power due to large sample size ($n = 5,629$), whereas Hughes' study had a low power with a sample size of 134 (Hughes).

The main limitation of this study was its reliance on self-reports of the quit attempt, which may have occurred some months before the interview. This is common to all studies of this phenomenon to date. Although we do not expect that the outcome of an attempt would influence memories of how it took place or that such memories would be influenced by the factors we have studied here, we cannot rule out these possibilities. Furthermore, we cannot rule out recall bias being a plausible explanation, at least in part, for the lower report of abrupt quitting among the socially disadvantaged since this group is more likely to have shorter or brief attempts (Fernandez et al., 2006), which are more easily forgotten. Another limitation might be the variation in understanding of what constitutes abrupt cessation. It is possible that some who claim to have quit abruptly may have cut down consumption prior to the quite date but do not see this activity as part of the quit attempt. The strengths of this study were the representative nature of the samples and the inclusion of a wide range of smokers.

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Declaration of Interests

None declared.

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