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How does a failed quit attempt among regular smokers affect their cigarette consumption? Findings from the International Tobacco Control Four-Country Survey (ITC-4)

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Abstract

Recent cross-sectional data suggests that smokers tend to reduce smoking following a failed self-initiated quit attempt, possibly motivated by the need to reduce harms or to facilitate future quitting or both. This study prospectively examined changes in cigarette consumption among adult smokers who relapsed from a quit attempt. It uses data from the first three waves of the International Tobacco Control Four-Country Survey (ITC-4), a random digit-dialed telephone survey of a cohort of over 9,000 adult smokers from the United Kingdom, United States, Canada, and Australia, followed up annually. Compared with those who did not make a quit attempt, relapsers were more likely to reduce consumption (average reduction of 0.7 vs. 3.4, respectively) over a mean period of 7 months between waves 1 and 2. Of the relapsers, 52% reduced their consumption by 5% or more, but 22% increased it. Smokers who smoked heavily at baseline, whose last quit attempt ended more recently, was of longer duration, and quit via a gradual cut-down method were all independently associated with reducing smoking following a failed attempt. These findings were similar across all four countries and were successfully replicated using waves 2–3 data. Change in consumption between waves 1 and 2 (whether increase or decrease) was maintained by a substantial number a year later (wave 3), but change did not undermine nor promote quitting between waves 2 and 3.

Introduction

Quitting is difficult. Many smokers who try to quit, either on their own or with help from cessation programs, fail in their attempt. Less than 4% of smokers stop each year even in

countries where the most effective cessation interventions are available (Giovino, 2002; Messer et al., 2007). In recent years, attention has turned to the possibility of encouraging those who are unable or unwilling to quit to reduce their cigarette consumption as an outcome goal. A recent review of mainly intervention trial studies by Hughes and Carpenter (2005) drew the conclusion that many smokers are able to reduce their smoking spontaneously and maintain significant reductions for long periods. The same review also concluded that adult smokers who try to quit and fail tend to return to a lower level of smoking but this reduction tends to dissipate over time.

There are several obvious reasons that might motivate smokers who have failed in a self-initiated attempt to quit to return to smoking less. Firstly, smokers who relapse may return to a lower level of smoking as an alternative way of reducing the health risk of smoking (i.e., adopting a harm reduction strategy). For these smokers, reducing consumption may be an alternative to quitting perhaps because quitting is perceived as being too difficult. This group would thus be less likely to make future quit attempts. On the other hand, there may be smokers who resume smoking at a lower level than before as a way of making it easier to make another quit attempt in the near future (adopting the quitting aid strategy). For these smokers, a lower level of consumption would enhance their self-efficacy for future quitting (Hughes, Cummings, & Hyland, 1999) and one would expect them to be more likely to make another quit attempt. A third possible reason for reduced smoking following a relapse is a loss of tolerance to nicotine particularly if they have been abstinent for a while (Perkins, 2002). It is hard to come up with a reason why smokers would choose to resume smoking and smoke more. Such a pattern is less likely to be under volitional control, perhaps reflecting dependence still developing, or perhaps reflecting a giving up on past attempts to constrain use.

Evidence from a recent intervention study (The Lung Health Study) by Hughes, Lindgren, Connett, and Nides (2004) suggests that most smokers who tried to quit and failed subsequently reduced their smoking and many were able to maintain reductions for long periods of time. They also found that reducers were more likely to subsequently make more quit attempts but were not more likely to succeed. Hyland et al. (2005) have found that smokers who reduced consumption by more than 50% for an extended period of time were more likely to quit in the future, but the reduction they studied was not linked to prior quit attempts. Hughes and Carpenter (2006) recently conducted a comprehensive qualitative review of the impact of smoking reduction on future cessation (based on 19 studies) and disease risk (based on 10 studies) among smokers not currently interested in quitting and concluded that smoking reduction leads to increased probability of future cessation but its impact on risk of smoking related diseases remains unclear. It should be noted that this review did not include a recent large scale Norwegian study that provided evidence to suggest that even a reduction of more than 50% in daily cigarette consumption does not reduce risk of premature death significantly (Tverdal & Bjartveit, 2006).

The effect of a failure to quit successfully on cigarette consumption upon resumption of smoking was examined recently by Knoke, Anderson, and Burns (2006) using a large cross-sectional data from a population-based study (the California Tobacco Survey). They found that smokers who made quit attempts and failed were more likely to reduce consumption

upon resumption of smoking and the magnitude of reduction in consumption was inversely related to time since the last attempt ended. The cross-sectional nature of the data precludes a firm conclusion to be drawn about the effect of a failed quit attempt on subsequent cigarette consumption. Besides, the sample was limited to the state of California, which has had very strong tobacco control activity relative to the other states in the United States, thus, may not be generalizable to settings where smoking is more accepted. The present study focuses on examining the pattern of change in cigarette consumption following a failure in a self-initiated quit attempt among adult smokers in the general population in four largely English-speaking countries using data from the first three waves of the ITC-4 survey. The availability of data from four countries will provide additional insight into any between country differences.

We first examined prospectively the impact of a self-initiated quit attempt made between baseline and follow-up waves on level of cigarette consumption among a large sample of continuing smokers. Then, among the subgroup who had made a quit attempt and relapsed, we examined: (a) the effect of recency and length of a failed quit attempt on cigarette consumption; (b) the proportion of smokers who spontaneously reduced, increased or showed no change in their cigarette consumption following a relapse; (c) characteristics of those who reduced and those who increased consumption as compared with those who returned to prequit smoking levels; (d) the extent to which change in consumption from baseline to follow-up was maintained 1 year later; and (e) the relationship between reduced and increased smoking, and subsequent quit attempts and success.

Methods

The International Tobacco Control Policy Evaluation Project (ITC) is a cohort survey conducted annually with adult smokers (18 years and older who smoked at least 100 cigarettes in lifetime) from Canada, the United States, the United Kingdom, and Australia (see Fong et al., 2006, and Thompson et al., 2006, for more details of the study). The three waves reported on here were conducted in October–December 2002, May–September 2003 (an average 7 months later), and August–December 2004 (an average 13 months later). The cooperation rates (defined as the proportion of eligible respondents who completed the survey), first and second follow-up rates (defined as the proportion retained from the wave before), respectively, were considered high for a survey of this kind: Canada 82.3%, 75.8%, and 70.0%; United States 83.2%, 62.8%, and 58.3%; United Kingdom 78.7%, 77.7%, and 65.1%; and Australia 78.8%, 81.4%, and 75.2%. The demographic profiles of the ITC-4 survey are similar to those of the national benchmark surveys used for calculating the weights to account and adjust for uneven representation (Thompson et al., 2006).

Procedure

The ITC study design is essentially a stratified random sampling design with just a single stage. The ITC cohort was constructed from probability sampling methods with telephone numbers selected at random from the population of each country, within strata defined by geographic region and community size. One respondent was randomly selected from each household contacted and verbal consent was obtained. The next birthday method was used

to randomly select the respondent in households with multiple smokers. The surveys were conducted using computer-assisted telephone interviewing (CATI) software. The study protocol was cleared for ethics by the Institutional Review Boards or Research Ethics Boards in each of the countries: 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).

Sample

Data used were from the first three waves of the ITC-4 survey. For the purpose of this study, 5922 participants who reported smoking daily and at least 5 cigarettes per day (CPD) at baseline, and were still smoking at follow up assessment were used for the longitudinal analysis of the overall change in cigarette consumption between waves 1 and 2. For all other analyses, we employed a subsample of 1,707 of the above group who reported having made a quit attempt but relapsed between baseline and follow-up waves (the relapsers). Of this subsample of relapsers, 1,159 provided data for wave 3 assessed a year later.

Measures

Sociodemographic and smoking behavior variables—These included age, sex, education, income, minority status, time to first cigarette (assessed by asking “How soon after waking do you usually have your first smoke?” and the response was coded: 0: 61+ min; 1: 31–60 min; 2: 6–30 min; 3: 5 min or less), and a number of CPD (which for the purpose of analysis was also coded as a four-level variable: 0: 0–10 CPD; 1: 11–20 CPD; 2: 21–30 CPD; 3: 31+ CPD).

Quitting variables—Quit method used during the most recent quit attempt reported at waves 2 and 3 were assessed by asking: “On your most recent quit attempt, did you stop smoking suddenly or did you gradually cut down on the number of cigarettes you smoked?” Respondents were also asked about how long ago (in days) did their most recent attempt ended and how long (in days) did they stay quit for to assess quit recency and quit length. Because the distribution of these two variables was highly skewed, we recoded them into categorical variables (Table 2) for the purpose of analyses.

At each wave we also asked about perceived difficulty of quitting: “How easy or hard would it be for you to completely quit smoking if you wanted to?”; self-efficacy of quitting: “If you decided to give up smoking completely in the next 6 months, how sure are you that you would succeed?,” whether they planned to quit in the next month, in the next 6 months, beyond 6 months, or were not planning to quit and whether in the last 6 months, they had used any stop-smoking medication.

Psychosocial and health variables—Respondents were asked to rate on a 5-point Likert scale how much they agreed or disagreed with the following statements: “If you had to do it over again, you would not have started smoking,” “Society disapproves of smoking” and “Smoking is an important part of your life.” Respondents were also asked to state whether they believed smoking causes heart disease, stroke, impotence, lung cancer in smokers and in nonsmokers. The responses were averaged to provide the knowledge of

health effects measure. Health worries were assessed using the question: “How worried are you, if at all, that smoking will damage your health in the future?” (Response categories include: not at all worried, a little worried, moderately worried, and very worried.) Overall self-rated health was assessed by asking respondents: “In general, how would you describe your health?” using a 5-point response scale ranging from poor (1) to excellent (5).

Key outcome variables

Change in CPD: Between-wave change in CPD was determined by taking the difference in CPD reported between two waves: This was then transformed into a categorical percentage change measure (greater than 50% decrease, 26–50% decrease, 5–25% decrease, no change or less than 5% change, 5–25% increase, 26–50% increase, and greater than 50% increase) similar to the one used by Falba, Jofre-Bonet, Busch, Duchovny, and Sindelar (2004) but we modified it slightly by redefining the no change group to include those with a change of less than 5% to account for potential error in reporting of CPD. In preliminary analyses, we compared this measure with a three-level categorical measure of change (reduced by at least 2 CPD vs. no change or <2 CPD change vs. increase by at least 2 CPD) and found that they are highly correlated ($r=.91$) and produced very similar results. So only results based on the percentage change measure are reported.

Subsequent quitting activity: At waves 2 and 3, respondents were asked the question “Have you made any attempts to stop smoking since we last talked with you?” to which they answered yes/no: Quit attempt was defined as any quit attempt made between waves that lasted for at least 24 hr. Among those who reported an attempt, they were also asked whether they were now back smoking or still stopped, to assess quitting success.

Statistical analysis

All analyses were conducted using complex survey commands in Stata SE Version 8.0 to adjust for stratification and sampling weights. Chi-square tests were employed to examine differences in categorical variables of interest. Analysis of variance was employed to examine effect of country, quit attempt, quit recency and length along with any interaction by country on mean change in CPD. Student Newman–Keuls post-hoc tests were conducted to determine country differences on mean change in CPD. Polynomial contrasts were employed to test for linear and nonlinear trend in the effect of quit recency and length on mean change. For binary outcomes, logistic regression analyses were first conducted to examine bivariately the unadjusted relationship between key outcome variables and a set of variables of interest. Then, these analyses were repeated by entering all variables of interest simultaneously into the model to examine their independent relationship with the outcome variables. The interactions between country and relevant independent variables were also examined in the predictive model using cross-product terms derived by multiplying country with the predictors of interest.

Results

Preliminary by-country analyses of the sample of relapsers indicated that there were significant country differences in sample characteristics and smoking behavior. The United

Kingdom had the greatest proportion of those aged 55 years and older while Australia had the least, $\chi^2(9)=42.88$, $p<.001$. The United States had a greater proportion having low income, $\chi^2(9)=28.67$, $p<.01$ but the lowest proportion with low level of education and from white or English speaking backgrounds, $\chi^2(6)=71.95$ and $\chi^2(3)=45.67$, both $p<.001$, respectively. The United States had the greatest number of relapsers who smoked at least 31 CPD while Canada had the least, $\chi^2(9)=61.52$, $p<.001$. The United States also had the most number of relapsers who reported smoking within 5 min of waking while the United Kingdom had the least, $\chi^2(9)=19.04$, $p<.05$. However, the gender distribution across the four countries was similar, $\chi^2(3)=3.61$, $p=.306$. Significant but small country differences in intersurvey interval (in days) between waves 1 and 2 and between waves 2 and 3 were found, $F(3,1643)=71.41$, $p<.001$ and $F(3,549)=4.46$, $p<.01$, respectively. Post-hoc tests indicated that U.S. participants had the longest average period between waves 1 and 2 (214 days) while Australians had the shortest (194 days). Between waves 2 and 3, Canada had longer surveying period than the other three countries (408 days vs. average of 399 days). Because of the country differences, time between waves was controlled for in all relevant subsequent analyses, but it had no effects.

Change in cigarette consumption by quit attempt, quit recency, and quit length

There was a mean decline of 1.5 CPD (from a mean base rate of 19.2 CPD) from baseline to the follow-up wave. Smokers from Australia and United States reduced more than those from the United Kingdom and Canada, $F(3,5913)=12.13$, $p<.001$. Overall, 29.0% of the sample had made a quit attempt between waves 1 and 2. Those who had made a quit attempt reduced more (3.4 CPD from an initial mean of 18.3) than those who had not (0.7 CPD from an initial mean of 19.6, $F(1, 5913)=125.83$, $p<.001$; Table 1). This gives a mean reduction of 2.7 CPD attributable to the quit attempt. Net reduction was largest in Australia (4.3 CPD) and least in Canada (1.7 CPD, $F(3,5913)=6.08$, $p<.001$). Among those who had made a quit attempt, significant linear trend was found for the effect of both quit recency and quit length on mean change in consumption ($F(2,1488)=11.75$, $p<.001$, and $F(2,1694)=6.40$, $p<.01$, respectively) with time since last quit attempt being inversely related to reduction, while length of last quit attempt was positively related. No significant interaction between country and quit recency or duration was found, $F(6,1488)=1.43$, $p=.198$ and $F(6,1694)=1.41$, $p=.208$, respectively.

Among the subgroup who had not attempted to quit between waves 1 and 2, we sought to replicate the above results using waves 2 and 3 data and found those who made a quit attempt between waves 2 and 3 reduced consumption by an average of 2.50 CPD compared with 0.26 CPD for those who did not make a quit attempt ($F(1,2616)=61.54$, $p<.001$), a net reduction of 2.3 CPD associated with the quit attempt. We failed, however, to replicate the country and country by quit attempt effects on mean change in consumption, $F(3,2616)=.76$, $p=.519$ and $F(3,2616)=1.87$, $p=.132$, respectively. Significant linear trend for the effect of quit recency was successfully replicated, $F(2,511)=4.31$, $p<.05$ but only a marginal linear trend was found for quit duration, $F(2,515)=2.57$, $p=.078$. Again, no country interaction was found for quit recency or duration, $F(6,511)=.54$, $p=.776$ and $F(6,515)=.85$, $p=.532$, respectively.

The distribution of changes (not reported in Table 1) shows that overall 40.3% had reduced their smoking by 5% or more between waves 1 and 2 while 26.8% had increased it. However, among those who had made a quit attempt and failed, 52.4% had reduced their smoking while 21.5% had increased it as compared with 35.2% and 29.0%, respectively, of those who did not make a quit attempt. Among the relapsers, 17.2% reduced by more than 50% while 4.6% increased by more than 50%.

Characteristics of reducers and increasers

Table 2 presents the results of logistic regression analyses showing both unadjusted and adjusted correlates of reducers (among those who tried to quit). Relative to the stable group, reducers were more likely to have come from Australia and the United States, and this relationship persisted even after adjusting for other potential confounders. The reducers were also more likely to be associated with wave 2 measures of: employing a gradual cut-down method in their last attempt, and having a last quit attempt that ended more recently. Interestingly, those who reported smoking heavily at baseline and also those who had been abstinent for longer period in their last quit attempt were also more likely to be reducers, but these effects only appeared after controlling for other confounders. Quitting self-efficacy, feeling regretful of smoking and perceiving smoking as being an important part of life measured at baseline were all significantly associated with being a reducer in the univariate analyses but their effects disappeared in the multivariate analyses. The predictive model was similar across the four countries.

In analyses not shown here, the only baseline factor associated with increasers (compared with the no change group) in both univariate and multivariate analyses was CPD. Those who smoked fewer CPD at baseline were more likely to increase smoking following a relapse.

Maintenance of waves 1–2 change in consumption at wave 3

Among those who reduced their consumption at wave 2 but were still smoking at wave 3, about two-thirds (68.5%) had kept their consumption below 5% of baseline at wave 3 (Table 3). However, mean CPD among this group of reducers increased from waves 2 to 3 by 3.0 CPD ($SE=.31$, $t=-9.88$, $p<.001$). For the increasers at wave 2 and those still smoking at wave 3, 51.6% stayed above 5% of baseline levels at wave 3. However, another 22% of the increasers had returned to within 5% of baseline level and 26% had reduced consumption below 5% of baseline level by that time. Reducers who had made another failed quit attempt between waves 2 and 3 were more likely to further reduce consumption compared with those who did not make another attempt ($\chi^2 [4]=20.82$, $p<.001$). However, there was no evidence of an effect of another quit attempt (between waves 2 and 3) on consumption for the increasers who were still smoking at wave 3 ($\chi^2 [4]=.19$, $p=.995$). There was also no evidence of between country differences in the overall results and as a function of quit attempt (waves 2–3) for both reducers ($\chi^2 [12]=12.22$, $p=.428$ and $\chi^2 [12]=17.60$, $p=.128$, respectively) and increasers ($\chi^2 [12]=10.79$, $p=.547$ and $\chi^2 [12]=10.45$, $p=.577$, respectively).

Impact on subsequent quitting activity

Recall that the harm reduction strategy hypothesis would predict that reduction in CPD among relapsers would be associated with a low perceived health risk of smoking (which we

assessed by asking how worried they were that smoking will damage their health) and low intention to quit, while a quitting aid strategy hypothesis would predict high quitting self-efficacy and high intention to quit again. We examined this by relating waves 1 to 2 reduction in CPD to these measures assessed at follow-up wave (wave 2) and found no relationship with perceived health risk of smoking, $\chi^2(1)=2.08$, $p=.149$, but reducers were more likely to have higher level of perceived quitting self-efficacy, $\chi^2(1)=22.74$, $p<.001$, and greater intention to quit again, $\chi^2(1)=5.41$, $p<.05$, consistent with the quitting aid hypothesis.

Overall, 65.3% of relapsers at wave 2 made another quit attempt between waves 2 and 3 and 14.5% had stopped smoking by wave 3. However, both bivariate and multivariate analyses revealed that changes in consumption between waves 1 and 2 was not significantly related to either making quit attempts or quit success assessed a year later at wave 3. We then conducted additional analyses to explore if those who made a large change in CPD (i.e., >50% decrease or increase) would promote or undermine subsequent quit attempt and quit success but again we failed to find any such effect.

Discussion

Consistent with previous research findings (e.g., Knoke et al., 2006; Hughes and Carpenter, 2005), data from this study demonstrates that making a quit attempt does lead to a net reduction in reported cigarette consumption. However, the magnitude of the reduction is generally small and even for the minority reducing a lot, it may generate no real health benefit (Tverdal & Bjartveit, 2006) apart from the small cost savings of reduced smoking to the smokers themselves, especially for those who are able to maintain their reduced consumption over a long period. Our data also show that relapsers who make another quit attempt are more likely to achieve further reduction in consumption. However, we failed to find any clear evidence that reduced consumption facilitates or undermines future quitting activity.

In interpreting the results, caution is required, as this study, like all others, relies on self-reported consumption and some of the reported effects could be related to systematic reporting biases (e.g., digit bias) rather than real effects. While we acknowledge this possibility, we are confident that the bulk of it is real, as similar effects are found both longitudinally and retrospectively (e.g., Hughes et al., 2004; Knoke et al., 2006). The validity of self-report of smoking has been confirmed previously (Patrick et al., 1994; Mak, Loke, Lam, & Abdullah, 2005). However, some of the differences are more likely to be effects of surveying, in particular, the 0.7 CPD reduction in consumption between waves 1 and 2 among those who did not make a quit attempt. Consumption can be generally assumed relatively stable over time particularly among established smokers as we have not observed any major changes in tobacco control environment in the four countries studied over the period of this study that would explain the reduction and average consumption does not change that much typically. Based on comparisons with the replenishment samples (not reported elsewhere in this paper), there appears to be a decline of around half a cigarette, associated with participation in the survey cohort, and an ongoing wave-to-wave decline of around half of this. The onset effect could be at least partly be caused by the increased focus on their smoking once they were in the study leading to improved observation at the next

wave. The ongoing effect is more likely to be related to a tendency of the survey to stimulate additional concern about smoking and thus, more than normal effects to control their smoking.

We are not sure why there were by-country effects, in particular why Australian and U.S. smokers were more likely to reduce their consumption than Canadian and U.K. smokers, even after controlling for potential confounders. That we found no by-country interaction on subsequent outcome is a strength of this study, as it shows considerable generality of the effects.

Another thing we do not know is whether the changes in consumption translate into changes in nicotine intake. Reducers could smoke their remaining cigarettes harder or move to higher per puff delivery cigarettes, and similarly increasers could move the other way. A dependence-based model would predict that it would only be among those who can actually sustain reduced nicotine intakes that the benefits of increased ease of cessation would be found. Assessment of smoke exposure using bio-measurements is needed. A recent review by Hughes and Carpenter (2005) concluded that compensatory smoking does occur with reduction in CPD but significant declines in carbon monoxide still occur, so exposure reductions are possible.

The greater magnitude of reduction in consumption among those who had made a quit attempt suggests that a quit attempt contributes to smoking reduction among continuing smokers in the general population. This is further supported by the finding that relapsers who made another quit attempt were able to further reduce their consumption compared with those who did not. These data suggest that multiple attempts at quitting may have the beneficial effect of keeping consumption lower than is otherwise would be for continuing smokers. As expected, those who smoked more heavily were more likely to reduce consumption. Consistent with Knoke et al.'s findings, those who relapsed recently were likely to report a greater reduction in consumption but it tends to creep back up again over time. The greater reduction in consumption upon resumption among those who have been abstinent for a longer time may be because these smokers have a reduced nicotine tolerance as a result of abstinence (Perkins, 2002). Novel to this study is the finding that those who employed a gradual cut-down strategy in their last quit attempt are more likely to reduce consumption following a failed quit attempt.

Consistent with Hughes et al. (1999) and Falba et al. (2004), we found a minority who showed an increase in consumption following a quit attempt. This subgroup of smokers deserves greater attention from researchers. Our data indicate that unlike reducers, increasers tend to be those whose baseline consumption level is relatively low (< 10 CPD). It could be that the increases from low levels are just picking up/recovery from past attempts to cut down, or it could be that the increases are those who are still on an uptake trajectory. We think that the latter is unlikely, as we found no evidence that increasers were predominantly younger smokers.

Our findings are generally contrary to the conclusion of the Hughes and Carpenter's (2006) review. We failed to find any evidence that reduced consumption (even by 50% or more)

facilitated subsequent quitting activity among our sample of relapsers. However, we did find an association between reduced consumption and higher self-efficacy and higher intention to quit at follow-up. This suggests that this subgroup of smokers had all the right conditions to encourage them towards quitting, so why it has not translated into better outcomes is unclear. Nevertheless, our studied sample is unlike most of the studies reviewed by Hughes and Carpenter (2006), which consisted of mainly intervention studies and where nicotine replacement therapy was used. Also, the positive association between reduced smoking and future quitting found by Hyland et al. (2005) was based on a much more sustained reduction than the several months (on average) that was the case here. These differences may account for the differences in findings.

In conclusion, making a quit attempt even when it fails generally results in reduced consumption, although the average amount declines over time. We found little evidence that a reduction in consumption among relapsers affects future cessation. Given the lack of any evidence of reducing consumption being beneficial apart from a small cost saving, we should not promote it as a harm reduction strategy even for those who could not or would not quit, or as a way station to quitting for those who have relapsed.

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Reported change in cigarettes per day (CPD) from baseline to follow-up among continuing smokers* by last quit attempt, quit recency, and quit length: weighted means and percentages.

Table 1

	Wave 1-wave 2 mean decrease in CPD/baseline (SE)				
	Canada	U.S.	U.K.	Australia	Combined
Overall (N=5,922)	1.3/18.1 (0.2)	1.9/20.3 (0.3)	0.9/18.1 (0.2)	2.2/20.6 (0.3)	1.5/19.2 (0.2)
Quit attempt					
<i>n</i>	1,468	1,145	1,625	1,684	5,922
Yes (<i>n</i> =1737)	2.3/16.9 (0.4)	4.1/19.2 (0.7)	2.3/16.5 (0.4)	5.3/20.6 (0.8)	3.4/18.3 (0.3)
No (<i>n</i> =4,185)	0.6/18.8 (0.3)	0.9/20.8 (0.3)	0.4/18.5 (0.2)	1.0/20.6 (0.2)	0.7/19.6 (0.1)
Among quit attempters:					
<i>n</i>	549	334	367	457	1707
Quit recency					
<1 month (<i>n</i> =591)	2.8/16.4 (1.1)	6.4/19.9 (1.7)	4.1/17.3 (0.8)	6.3/19.9 (1.0)	4.7/18.2 (0.5)
1 to <3 months (<i>n</i> =576)	1.7/17.5 (0.6)	5.7/18.5 (1.3)	2.0/17.1 (0.5)	5.5/20.9 (1.7)	3.7/18.7 (0.6)
3 months (<i>n</i> =468)	1.9/16.7 (0.5)	0.7/18.5 (1.1)	0.1/14.8 (0.8)	2.4/21.8 (1.2)	1.3/17.8 (0.4)
Quit length					
<1 week (<i>n</i> =946)	1.4/17.6 (0.5)	3.8/20.0 (0.9)	1.6/17.4 (0.6)	4.0/21.2 (0.8)	2.6/19.0 (0.4)
1 wk to 1 month (<i>n</i> =526)	3.1/16.3 (0.6)	3.5/18.5 (1.1)	3.5/16.2 (0.7)	6.1/20.8 (2.3)	4.0/17.9 (0.7)
>1 month (<i>n</i> =235)	3.1/16.1 (0.9)	10.4/16.2 (3.2)	1.1/14.4 (1.2)	7.3/19.7 (1.5)	4.6/16.8 (0.7)

Note. SE, standard error of mean decrease in CPD presented in parentheses; denominators are baseline CPD.

* Smoking at least 5 CPD on a daily basis at baseline.

Table 2

Characteristics of daily smokers who reduced smoking as compared to those who showed no change following a failed quit attempt between baseline and follow-up wave (on average 7 months apart).

Variables	Smokers who had reduced smoking (n=941)	
	Unadjusted OR	Adjusted OR
Sociodemographic variables		
Age		
18–24 vs. 55+	1.48 (0.92–2.38)	1.06 (0.63–1.78)
25–39 vs. 55+	0.85 (0.59–1.21)	0.72 (0.45–1.14)
40–54 vs. 55+	1.03 (0.71–1.50)	0.89 (0.55–1.42)
Gender		
Female vs. male	1.05 (0.83–1.32)	1.26 (0.93–1.70)
Education		
Moderate vs. low	1.02 (0.78–1.32)	1.26 (0.90–1.76)
High vs. low	0.89 (0.62–1.28)	1.22 (0.76–1.96)
Income		
Moderate vs. low	0.87 (0.65–1.16)	0.97 (0.67–1.40)
High vs. low	1.04 (0.77–1.42)	1.25 (0.84–1.88)
Refused vs. low	1.00 (0.59–1.71)	1.11 (0.55–2.25)
Minority status		
Other vs. identified minorities	0.87 (0.62–1.24)	0.70 (0.43–1.14)
Country		
Canada vs. Australia	0.55 (0.38–0.78) ^c	0.61 (0.39–0.97) ^a
U.S. vs. Australia	0.87 (0.57–1.32)	1.11 (0.65–1.90)
U.K. vs. Australia	0.56 (0.38–0.83) ^b	0.60 (0.37–0.99) ^a
Intersurvey interval (days)	0.99 (0.99–1.00)	0.99 (0.99–1.01)
Smoking behavior variables		
Baseline cigarettes per day		
11–20 cigarettes vs. 5–10 cigarettes	1.08 (0.81–1.44)	1.46 (0.94–2.29)
21–30 cigarettes vs. 5–10 cigarettes	1.23 (0.88–1.71)	1.94 (1.12–3.37) ^a
Baseline time to first cigarette upon waking		
31–60 min vs. >60 min	0.92 (0.61–1.40)	1.05 (0.63–1.76)
6–30 min vs. >60 min	0.86 (0.60–1.24)	0.98 (0.60–1.58)
<5 min vs. >60 min	0.78 (0.52–1.18)	1.09 (0.60–1.98)
Quitting variables		
Baseline intending to quit	1.05 (0.93–1.20)	1.09 (0.92–1.29)
Baseline quit attempts		
Tried within last year vs. never/tried >1 year ago	0.92 (0.73–1.17)	0.74 (0.54–1.01)
Quit recency of last attempt (at wave 2)		
1 month to <3 months vs. <1 month	0.64 (0.45–0.91) ^a	0.50 (0.34–0.74) ^c
3 months or more vs <1 month	0.53 (0.36–0.77) ^c	0.42 (0.28–0.65) ^c

Variables	Smokers who had reduced smoking (n=941)	
	Unadjusted <i>OR</i>	Adjusted <i>OR</i>
Quit length of last attempt (at wave 2)		
1 week to 1 month vs. <1 week	1.24 (0.95–1.61)	1.28 (0.90–1.84)
>1 month vs. <1 week	1.32 (0.93–1.87)	1.72 (1.03–2.88) ^a
Method to quit at last attempt (at wave 2)		
Gradual cut-down vs. stopped abruptly	2.04 (1.49–2.78) ^c	2.37 (1.65–3.41) ^c
Baseline self-efficacy of quitting	1.13 (1.01–1.27) ^a	1.05 (0.92–1.20)
Baseline difficult without smoking for a whole day	0.97 (0.86–1.09)	0.92 (0.77–1.11)
Baseline difficult to quit permanently	0.91 (0.81–1.01)	0.99 (0.85–1.17)
Baseline recently used quit medications, yes vs. no	0.89 (0.68–1.78)	1.05 (0.73–1.49)
Psychosocial and health variables		
Baseline regret smoking	0.79 (0.67–0.94) ^b	0.87 (0.69–1.08)
Baseline society disapproves of smoking	0.87 (0.74–1.02)	0.94 (0.79–1.12)
Baseline smoking an important part of life	0.82 (0.73–0.92) ^c	0.88 (0.75–1.03)
Baseline knowledge of health effects	0.77 (0.45–1.32)	0.79 (0.39–1.62)
Baseline overall self-rated health	0.97 (0.87–1.09)	0.94 (0.80–1.11)
Baseline worried smoking will damage health	0.95 (0.84–1.07)	0.94 (0.78–1.12)

Note.

^a Significant at $p < .05$;

^b $p < .01$;

^c $p < .001$; Numbers in parentheses are 95% *CI*.

Table 3

Maintenance of waves 1–2 change in CPD over time (waves 2–3) by quit attempt between waves 2 and 3.

	<i>n</i>	%	% quit attempt (waves 2–3)
Among waves 1–2 reducers (<i>n</i> =493)			
Reduced further from waves 2–3 by 5% or more	113	23.7	77.6
No clear change ($\pm 5\%$) between waves 2 and 3	87	15.8	60.9
Increased between waves 2 and 3 but not to ($\pm 5\%$ of) baseline	134	29.0	59.1
Returned to ($\pm 5\%$ of) baseline	94	18.8	48.9
Increased between waves 2 and 3 and exceeded (5% of) baseline	63	12.7	56.2
Among waves 1–2 increasers (<i>n</i> =196)			
Increased further from waves 2–3 by 5% or more	42	20.5	61.4
No clear change ($\pm 5\%$) between waves 2 and 3	45	20.7	58.8
Reduced between waves 2 and 3 but still above (5% of) baseline	23	10.4	61.9
Reduced and back to ($\pm 5\%$ of) baseline	44	22.2	58.3
Reduced to below (<5% of) baseline	42	26.2	58.7

Note. CPD, cigarette per day; time between waves 2 and 3 is on average 13 months. Percentages are based on weighted data.