

## Original Investigation

# The impact of the United Kingdom's national smoking cessation strategy on quit attempts and use of cessation services: Findings from the International Tobacco Control Four Country Survey

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## Abstract

**Introduction:** The World Health Organization Framework Convention on Tobacco Control recommends that provision of cessation support should be included in national tobacco control strategies. This study examines the impact of the United Kingdom's national smoking cessation strategy on quit attempts, use of treatment and short-term abstinence, relative to the United States, Canada, and Australia where less support is provided.

**Methods:** Data on quitting behavior and use of support were obtained for all smokers enrolled in the International Tobacco Control 4 Country Survey between 2002 and 2005. Generalized estimating equations were used to calculate the relative odds (adjusted by age, sex, and Heaviness of Smoking Index) that smokers in each country made quit attempts, used behavioral or pharmacological support, and to compare rates of short-term (28 days) abstinence between countries and users of different forms of support.

**Results:** U.K. smokers were less likely to have attempted to quit smoking than those in Australia (odds ratio [OR] = 1.25, 95% CI: 1.12–1.40), Canada (OR = 1.50, 95% CI: 1.34–1.67), and the United States (OR = 1.25, 95% CI: 1.11–1.40) but were more likely to use pharmacotherapy and/or support from a clinic, helpline, or health professional when attempting to quit than smokers in the other countries. U.K. smokers making quit attempts were significantly more likely to achieve 28-day abstinence than those in Australia (OR = 0.59, 95% CI: 0.49–0.71), Canada (OR = 0.72, 95% CI: 0.61–0.87), and the United States (OR = 0.51, 95% CI: 0.42–0.62).

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**Conclusions:** U.K. smokers report fewer quit attempts but are more likely to use support when quitting and to achieve short-term abstinence.

## Introduction

There are thought to be 1.8 billion tobacco smokers worldwide (Guindon & Boisclair, 2003), resulting in more than 6 million preventable premature deaths each year (World Health Organization [WHO], 2002). The WHO Framework Convention on Tobacco Control (World Health Organization, 2003) recommends that governments put in place comprehensive national tobacco control strategies, which should include the provision of treatment of tobacco dependence including counseling services and effective stop smoking medications. Although tobacco treatment has been proven in randomized trials to be effective in helping smokers to quit, and a more cost-effective way to improve health than most other clinical treatments or interventions (Parrott, 2004; Warner & Mackay, 2008), it has been suggested that less investment should be made in providing tobacco treatment (Chapman, 2009).

In 1998, the U.K. government published *Smoking Kills: A White Paper on Tobacco* (Department of Health, 1998), a strategy to reduce smoking in which a commitment was made to tobacco control policies that promote quit attempts and reduce the drivers to smoke, as well as the provision of cessation support for smokers wanting to quit. The rationale for cessation support is that tobacco dependence is a chronic condition and

only about 7% of smokers achieve long-term success when attempting to quit on their own (Anthonisen et al., 2005; The Tobacco Use and Dependence Clinical Practice Guideline Panel Staff, 2000). Effective support can result in up to a fourfold increase in the chances of successfully quitting (The Tobacco Use and Dependence Clinical Practice Guideline Panel Staff) and has been identified as one of the most cost-effective life saving medical interventions (Parrott, 2004; Tengs et al., 1995). Since 1998, the United Kingdom has established a range of government-funded services to support smokers who are attempting to stop. These have been built up over the years and include a national network of National Health Service (NHS) Stop Smoking Services, which provide cessation medications and offer specialist behavioral support from trained staff over a minimum period of 4 weeks; brief advice and referrals to the services from a range of health professionals; and a toll-free telephone helpline for smokers. In addition, pharmacotherapies to treat nicotine addiction, including nicotine replacement therapy (NRT) products, bupropion and later varenicline, became available either free or for a subsidized fee (currently £7.20 per item—typically enough to last 14 days after an agreed target stop date, with longer durations supplied as required thereafter for the same fee) via the NHS prescribing system, and restrictions on the general and over-the-counter sale of NRT products were relaxed. These interventions have been implemented, over time, across all the countries of the United Kingdom, and the United Kingdom is now unique in having such a comprehensive national network of specialist cessation support. Although concerns have been raised that the United Kingdom's focus on treatment is inappropriate and expensive and runs the risk of medicalizing the problem and deterring smokers from making quit attempts (Chapman, 2009), to date, the impact of the United Kingdom's cessation strategy has not been measured.

We used data from the International Tobacco Control (ITC) Four Country Survey, a cohort survey of adult smokers in the United Kingdom, Australia, Canada, and the United States, to investigate the impact of these measures. In 2008, the WHO (2009) ranked member countries according to the level of provision of smoking cessation support, based on the universal availability of NRT and specialist behavioral support, the existence of a national telephone support service, and the extent to which such services are cost-free at the point of delivery. The United States and Canada both scored 2/4 according to this scheme as NRT and support services are widely available but many health insurance plans do not provide subsidy. Australia and the United Kingdom both scored 4/4; however, it should be noted that the U.K. services exceed the requirements by a wide margin (and are highlighted in the report as a model implementation). We therefore hypothesized that the United Kingdom's comprehensive national smoking cessation strategy would result in U.K. smokers being more likely to make use of support services and pharmacotherapy during quit attempts and remaining abstinent from smoking for longer than smokers in the other three countries.

## Methods

### Study population

The ITC Four Country Survey (ITC-4C) is a telephone cohort survey of approximately 8,000 smokers in Australia, Canada,

the United Kingdom, and the United States. The survey is designed to evaluate the impact of key national-level tobacco control policies upon behavioral and psychosocial predictors of tobacco use. The study cohort comprises adult daily smokers and recent ex-smokers who are aged 18 years or older, have smoked more than 100 cigarettes in their life, and smoke (or previously smoked) at least 1 cigarette/day. The first survey (Wave 1) was conducted in late 2002. The second survey (Wave 2) was conducted a mean of 7 months later and subsequent annual waves had mean interwave intervals of 12–14 months.

The ITC-4C methodology is described in detail elsewhere (Fong et al., 2006) but, in brief, the study population was recruited using probability sampling methods with fixed-line telephone numbers selected at random from the population of each country, within strata defined by geographic region and community size. Individuals enrolled in the study were reinterviewed annually unless they could not be contacted or declined to participate further. Identical random sampling methods were used to replenish the study population at each wave, in order to maintain a similar overall number of participants. In order to maximize response rates, participants were mailed compensation equivalent to £15 for agreeing to complete each survey.

Each individual enrolled in the ITC cohort is asked a series of questions relating to quit attempts, abstinence from smoking, and receipt of support during the time since the last survey wave or in the 6 months prior to the first survey in which they participated. Responses from the first wave in which each individual participated were excluded as all participants were current smokers at the time of recruitment (producing a natural censoring of recent quit attempt duration) and to ensure that other comparisons were made during a consistent time interval (the whole period between surveys).

## Analyses

All analyses were carried out using STATA 11.0 for Mac OS 10.6.2 (Stata corporation, College Station, TX).

### Advice and support from medical professionals

Among smokers and recent quitters who reported having visited a doctor or other health professional in the period prior to each survey, logistic regression models were used to determine the odds that individuals had received advice to quit smoking and “additional help or referral to a specialist service” in Australia, Canada, and the United States relative to the United Kingdom, using data from individual survey waves and from Waves 2 to 4 combined.

### Attempts to quit and use of support

Individuals were defined as having tried to quit smoking at each survey if they reported having made at least one attempt to quit smoking since their last interview. Logistic regression models were used to determine the odds that individuals in Australia, Canada, and the United States attempted to quit relative to those in the United Kingdom, using data from individual survey waves and from Waves 2 to 4 combined. Among those who attempted to quit, similar analyses were used to determine the relative odds that individuals received additional help or a referral from a medical professional, support from a clinic or helpline, pharmacotherapy, and a combination of pharmacotherapy and another form of support.

## Abstinence from smoking and the effectiveness of support

Responses to questions regarding the start date of quit attempts ongoing on the date of the survey, the outcome and duration of quit attempts ongoing on the date of the previous survey, the end date of the most recent quit attempt, and the duration of the longest completed quit attempt between surveys were used to estimate the start date and duration of as many quit attempts as possible for each participant. Details of quit attempts that began prior to the date of recruitment were excluded from the analysis for the reasons outlined previously.

Among these defined quit attempts, logistic regression models were used to determine the odds of reaching 28-day abstinence from smoking in Australia, Canada, and the United States, relative to the United Kingdom, using pooled data from all waves. The association between use of different forms of support and reaching 28-day abstinence from smoking was also calculated using logistic regression models. To obtain country-specific estimates for the effect of each type of support, we added an interaction term between country and support type to the model, enabling us to calculate the odds of reaching 28-day abstinence among recipients of support in each country relative to those in the same country who did not receive support. Support use was defined using mutually exclusive categories: additional help or referral from a medical professional in the absence of support from a clinic or helpline, support from a clinic or helpline, pharmacotherapy in the absence of any other support, and pharmacotherapy combined with another form of support. Finally, the model used to determine the odds of reaching 28-day abstinence in each country relative to the United Kingdom was adjusted for use of support in order to estimate the fraction of any differences in short-term abstinence attributable to differences in the use of support.

## Adjustments

All analyses were adjusted by age, sex, and Heaviness of Smoking Index (HSI) to account for differences in the characteristics of smokers in the four countries. Where data from multiple surveys were combined (and individuals could contribute multiple recordings to the analysis), models were fitted using generalized estimating equations (Hanley, Negassa, deBurgh Edwardes, & Forrester, 2003), a semiparametric extension of generalized linear models that are designed to derive robust population-averaged effect estimates from clustered data without the need to specify the origin of any intracluster correlation in detail. Models were clustered on the individual, using an exchangeable correlation structure.

## Results

Table 1 shows the basic demographic characteristics of the study population, details of the overall numbers making quit attempts and using support, and details of duration and support use among individual quit attempts. At first recruitment, there were more female than male smokers. Levels of tobacco dependence (as measured by the HSI) were similar in each of the four countries. U.K. smokers reported having made similar numbers of quit attempts at any time prior to recruitment to those in the other three countries but were less likely to indicate firm plans to quit in the 6 months after recruitment.

Data were available for fewer individual quit attempts in the United Kingdom and the United States than the other two countries. The duration of these quit attempts was longest in the United Kingdom and shortest in the United States. The overall number of participants was considerably higher in the United States than in the other three countries, indicating a greater level of loss to follow-up and sample replenishment between surveys. Fewer visits to the doctor were made in the United Kingdom than the other three countries. During any visit to the doctor of health professional advice, the majority of smokers had received advice about quitting (the highest proportion in the United States at nearly three-quarters, compared with the other three countries), but only a small minority had received additional help or referral to a smoking cessation service (the highest was in the United Kingdom at 26%). The use of support among those who attempted to quit smoking was greater in the United Kingdom than the other three countries; for example, almost twice as many individuals in the United Kingdom had used a specialist clinic or helpline as in Australia (27.8% vs. 14.1%). Use of pharmacotherapy also varied across countries, with individuals in the United Kingdom having the highest use at 37.5% of attempted quitters and the United States the least use at 25.6%.

Table 2 shows the adjusted relative odds of having received advice to quit and of having received additional help or a referral to a cessation support service among those who visited a doctor or other health professional, both in individual survey waves and overall. Smokers in the United Kingdom were less likely to receive advice to quit smoking than those in Canada (adjusted odds ratio = 1.21, 95% CI: 1.06–1.37) and the United States (odds ratio [OR] = 2.17, 95% CI: 1.89–2.48) and more likely than those in Australia (OR = 0.87, 95% CI: 0.77–0.99). These differences appeared to diminish in successive survey waves. Individuals in the United Kingdom were considerably more likely to receive additional help or a referral than those in the other countries, and these differences appeared (broadly) to increase in successive survey waves.

Table 3 shows the relative odds of having made at least one attempt to quit smoking since the previous survey and of having received support during quit attempts, both overall and in each individual survey wave. Smokers in the United Kingdom were less likely overall to have attempted to quit smoking than those in Australia (OR = 1.25, 95% CI: 1.12–1.40), Canada (OR = 1.50, 95% CI: 1.34–1.67), and the United States (OR = 1.25, 95% CI: 1.11–1.40). These differences appeared (broadly) to diminish in successive waves. Attempted quitters in the United Kingdom were significantly more likely to have received each form of support than those in Australia, Canada, or the United States. These differences appeared to increase in successive waves.

Table 4 shows the relative odds of having reached 28-day abstinence among individuals making quit attempts (where the duration of the attempt could be estimated) between survey Waves 1 and 4. Individuals in the United Kingdom were significantly more likely to achieve 28-day abstinence from smoking than those in Australia (OR = 0.59, 95% CI: 0.49–0.71), Canada (OR = 0.72, 95% CI: 0.61–0.87), and the United States (OR = 0.51, 95% CI: 0.42–0.62).

Overall, quit attempts involving each form of support were significantly more likely to be successful than those that were unsupported, although there were notable differences in

**Table 1. Characteristics and use of support among individuals participating in two or more waves of the International Tobacco Control Four Country Survey (2002–2005)**

	The United Kingdom	Australia	Canada	The United States	<i>p</i> <sup>a</sup>
Individuals participating in 2 or more survey waves, <i>n</i> (%)	2,444 (25.6)	2,467 (25.8)	2,417 (25.3)	2,237 (23.4)	–
Age (mid-2003), median (IQR)	44 (34–55)	39 (29–49)	42 (32–52)	45 (33–55)	<.01 <sup>b</sup>
Sex, %					
Females	56.0	53.7	55.8	57.9	.04
Males	44.0	46.3	44.2	42.1	
Heaviness of Smoking Index at entry, mean ( <i>SD</i> )	2.5 (1.5)	2.6 (1.7)	2.6 (1.6)	2.6 (1.6)	.22 <sup>c</sup>
Typical daily cigarette consumption at entry, median (IQR)	18 (12–20)	20 (12–25)	16 (10–25)	20 (10–20)	<.01 <sup>b</sup>
Intend to quit within 6 months of recruitment, <i>n</i> (%)	692 (28.3)	878 (35.6)	1,038 (43.0)	728 (32.5)	<.01
Estimated total number of quit attempts made prior to recruitment, median (IQR) <sup>d</sup>	3 (2–5)	3 (2–5)	3 (2–5)	3 (2–5)	.15
In the first year after recruitment					
Visited a doctor or other health professional, <i>n</i> (% of country total)	1,335 (54.6)	1,772 (71.8)	1,633 (67.6)	1,578 (70.5)	<.01
During any visit					
Received advice about quitting, % (of visitors)	54.8	47.9	56.6	69.3	<.01
Received additional help or referral to cessation service, %	19.7	5.7	8.7	10.1	<.01
Made 1 or more quit attempts, <i>n</i> (% of country total)	867 (37.1)	959 (41.1)	991 (43.3)	834 (38.8)	<.01
During any attempt					
Received support from a clinic or helpline, % (of quitters)	22.7	9.2	11.1	14.2	<.01
Used pharmacotherapy, %	42.1	36.3	35.1	28.3	<.01
At any time during follow-up					
Visited a doctor or other health professional, <i>n</i> (% of country total)	1,644 (67.3)	2,024 (82.0)	1,893 (78.3)	1,735 (77.6)	<.01
During any visit					
Received advice about quitting, % (of visitors)	61.9	58.3	64.5	74.6	<.01
Received additional help or referral to cessation service, %	26.0	9.1	12.7	14.2	<.01
Made 1 or more quit attempts, <i>n</i> (% of country total)	1,220 (50.4)	1,341 (54.7)	1,353 (56.4)	1,089 (49.1)	<.01
During any attempt					
Received support from a clinic or helpline, % (of quitters)	27.8	14.1	19.0	20.8	<.01
Used pharmacotherapy, %	47.7	40.4	40.0	31.9	<.01
All quit attempts of known duration, <i>n</i>	1,820	2,133	2,100	1,539	
Duration (days), median (IQR)	21 (7–56)	14 (5–30)	14 (5–42)	14 (4–30)	<.01 <sup>b</sup>
Received support from a clinic or helpline, % <sup>e</sup>	5.1	4.0	4.7	5.9	<.01
Received additional help from a doctor or other health professional, % <sup>e</sup>	5.5	3.3	3.5	5.3	<.01
Used pharmacotherapy only, % <sup>e</sup>	36.9	35.3	35.3	26.3	<.01
Used pharmacotherapy and received support from a clinic, helpline, doctor, or other health professional, % <sup>e</sup>	19.0	7.6	8.8	9.8	<.01

Note. IQR = Inter-quartile range.

<sup>a</sup>Chi-square tests for equality of proportions, except where stated.

<sup>b</sup>Kruskal–Wallis test for equality of medians.

<sup>c</sup>One way analysis of variance for equality of means.

<sup>d</sup>A small number of outliers reporting more than 100 attempts were excluded from the statistical comparison.

<sup>e</sup>Mutually exclusive categories.

the individual country effects. Quit attempts using pharmacotherapy were more likely to be successful than those that were unsupported, especially when combined with another form of support. Similar effects were observed in each country except the United States. Support from a cessation clinic or helpline was associated with an increased odds of abstinence in the United Kingdom and Canada but not in the United States or Australia, while help from a medical professional was associated with an increased odds of abstinence in Australia and Canada but not in the United States or the United Kingdom.

Table 5 shows the fraction of the difference in 28-day abstinence between the United Kingdom and each of the other

three countries attributable to the use of behavioral support and/or pharmacotherapy. Use of support only accounted for between 7.3% (Australia) and 17.9% (Canada) of the observed differences.

## Discussion

We found that smokers in the United Kingdom reported fewer quit attempts than smokers in the other three countries and were less likely to report receiving advice to quit from a doctor than smokers from the United States or Canada. When making these quit attempts, U.K. smokers were more likely to report

**Table 2. Relative odds of having received advice or support from a doctor or other health professional since the last survey, by country (2002–2005)**

Country	Wave 2	Wave 3	Wave 4	Waves 2–4 combined
Among those who visited a doctor or other health professional				
Received advice to quit smoking				
The United Kingdom	Referent			
Australia	1.08 (0.89–1.29)	0.93 (0.76–1.14)	0.65 (0.53–0.80)	0.87 (0.77–0.99)
Canada	1.52 (1.25–1.84)	1.21 (0.99–1.47)	0.95 (0.78–1.17)	1.21 (1.06–1.37)
The United States	2.51 (2.05–3.08)	2.15 (1.73–2.67)	1.92 (1.54–2.39)	2.17 (1.89–2.48)
Received additional help or a referral to a specialist clinic				
The United Kingdom	Referent			
Australia	0.24 (0.17–0.33)	0.30 (0.22–0.41)	0.24 (0.18–0.33)	0.26 (0.21–0.32)
Canada	0.51 (0.38–0.68)	0.32 (0.23–0.43)	0.37 (0.28–0.49)	0.39 (0.33–0.48)
The United States	0.52 (0.38–0.71)	0.58 (0.43–0.78)	0.43 (0.32–0.57)	0.51 (0.43–0.61)

using support and report quit attempts lasting at least 28 days (short-term success) than smokers from the other three countries. There were differences in the effect of support across country and support used, possibly reflecting differences in the nature of the services provided, their pattern of use, and differing degrees of overlap between sources of support, but in general, the use of support increased the short-term success of quit

attempts. Although the use of support increased short-term success, this did not entirely explain the increased short-term success of the quit attempts in the United Kingdom.

Assuming that the summary (combined wave) odds ratios given in Table 3 approximately represent the relative probabilities of smokers in each country making a quit attempt in any

**Table 3. Relative odds of having attempted to quit smoking and of having received support during quit attempts, by country (2002–2005)**

Country	Wave 2	Wave 3	Wave 4	Waves 2–4 combined
Made one or more attempts to quit				
The United Kingdom	Referent			
Australia	1.22 (1.04–1.66)	1.45 (1.22–1.58)	1.08 (0.91–1.28)	1.25 (1.12–1.40)
Canada	1.86 (1.59–2.17)	1.60 (1.35–1.90)	1.04 (0.87–1.23)	1.50 (1.34–1.67)
The United States	1.40 (1.18–1.66)	1.31 (1.09–1.58)	1.02 (0.86–1.22)	1.25 (1.11–1.40)
Among whom				
Received support from specialist stop smoking clinic or helpline				
The United Kingdom	Referent			
Australia	0.45 (0.31–0.68)	0.42 (0.28–0.62)	0.22 (0.15–0.33)	0.34 (0.27–0.44)
Canada	0.42 (0.28–0.63)	0.44 (0.30–0.64)	0.38 (0.27–0.55)	0.40 (0.32–0.51)
The United States	0.83 (0.57–1.22)	0.61 (0.41–0.91)	0.42 (0.29–0.60)	0.59 (0.47–0.74)
Received pharmacotherapy				
The United Kingdom	Referent			
Australia	0.92 (0.69–1.23)	0.78 (0.58–1.04)	0.60 (0.45–0.80)	0.76 (0.64–0.92)
Canada	0.91 (0.69–1.20)	0.74 (0.22–0.98)	0.51 (0.38–0.68)	0.70 (0.58–0.84)
The United States	0.57 (0.42–0.79)	0.53 (0.38–0.73)	0.59 (0.44–0.80)	0.56 (0.46–0.68)
Received additional help or referral from a doctor or other health professional				
The United Kingdom	Referent			
Australia	0.26 (0.15–0.42)	0.40 (0.26–0.61)	0.32 (0.20–0.49)	0.32 (0.24–0.42)
Canada	0.40 (0.26–0.61)	0.33 (0.22–0.51)	0.43 (0.28–0.65)	0.38 (0.29–0.49)
The United States	0.45 (0.28–0.71)	0.51 (0.33–0.78)	0.53 (0.35–0.80)	0.48 (0.37–0.63)
Received both pharmacotherapy and help from a clinic, helpline, doctor, or health professional				
The United Kingdom	Referent			
Australia	0.38 (0.24–0.62)	0.37 (0.24–0.56)	0.23 (0.15–0.36)	0.33 (0.25–0.43)
Canada	0.37 (0.23–0.58)	0.37 (0.24–0.54)	0.33 (0.22–0.49)	0.35 (0.27–0.45)
The United States	0.45 (0.28–0.74)	0.39 (0.25–0.61)	0.42 (0.28–0.64)	0.42 (0.32–0.55)

**Table 4. Relative odds of remaining abstinent for 28 days or longer among those making quit attempts (of known duration), by country and type of support received (Waves 1–4)**

Country	Adjusted odds ratio (95% CI)
The United Kingdom	Referent
Australia	0.59 (0.49–0.71)
Canada	0.72 (0.61–0.87)
The United States	0.51 (0.42–0.62)
By use of support (mutually exclusive categories vs. no support)	
Smoking cessation clinic or helpline	1.38 (1.09–1.75)
The United Kingdom	1.92 (1.20–3.06)
Australia	0.56 (0.30–1.02)
Canada	2.00 (1.30–3.09)
The United States	1.25 (0.75–2.08)
Pharmacotherapy	1.61 (1.43–1.83)
The United Kingdom	1.50 (1.18–1.90)
Australia	1.45 (1.15–1.83)
Canada	2.03 (1.62–2.54)
The United States	1.29 (0.96–1.74)
Help from a doctor or other health professional	1.42 (1.09–1.84)
The United Kingdom	0.72 (0.43–1.19)
Australia	2.45 (1.48–4.06)
Canada	1.92 (1.12–3.29)
The United States	1.21 (0.70–2.10)
Both pharmacotherapy and help from a clinic, helpline, doctor, or other health professional	2.04 (1.70–2.46)
The United Kingdom	2.13 (1.58–2.87)
Australia	1.96 (1.32–2.90)
Canada	2.13 (1.48–3.08)
The United States	1.14 (0.71–1.85)

given year and that those in Table 4 represent the relative probabilities of reaching 28-day abstinence, we estimate that, overall, smokers in the United Kingdom are 36% more likely to reach 28-day abstinence than those in the United States, 26% more likely than those in Australia, but 8% *less* likely than those in Canada. In Canada, the much greater proportion of smokers making quit attempts than in the United Kingdom appears to be the important factor.

The major strength of this study is our use of data from a large, prospective multicountry cohort, collected using representative population sampling methods and a standardized interview-based questionnaire (with only minor variations in colloquial English) with an extensive period of follow-up. Use of these data permits comparison between smokers in the four countries with minimal risk of bias due to differences in data collection methodologies.

This study has several limitations, which may affect interpretation of our findings. ITC data are collected from fixed-line telephone users in each country and therefore exclude individuals who rely exclusively on mobile telephony or who have no access to the telephone system. The ratio of mobile phone subscriptions to fixed-line subscriptions is presently low in all four

countries (2.3 in the United Kingdom, 1.7 in the United States, 3.3 in Australia, and 1.2 in Canada vs. a maximum of 366.0 in Liberia and in international average of 3; International Telecommunication Union—BDT, 2010), so this should have minimal impact on our findings, although there remains a small risk of biased selection.

Data on quit attempts and use of support are self-reported and may be subject to recall bias, potentially as a function of the length of the quit attempt, its recency, and/or the intensity of help received. We were unable to definitively associate the use of support with specific quit attempts, which would introduce random error and reduce the magnitude of the observed associations. Data regarding duration of abstinence are available for a maximum of one new quit attempt per person per survey, which reduces statistical power, although the quit attempts recorded in the dataset should represent a random sample of those occurring in the population; surveys are conducted at roughly the same time in each year of data collection in each country so it is unlikely that there is any bias due to seasonal effects.

A number of individuals were lost to follow-up between surveys, and there is evidence to suggest that this attrition was greater in the United States than in the other countries. This may lead to the study sample becoming less representative of the source populations over time, as randomly selected new recruits replace individuals (possibly nonrandomly) lost to follow-up, and to a bias toward new recruits in the countries most affected. The impact of such demographic differences between new and existing recruits should, however, be mitigated by our having adjusted all results by age, sex, and HSI. We did not control for the impact of other tobacco control policies implemented during the course of the study as this would be hard to do, given the exact impact of individual policies in different countries is not yet known, although we think it is unlikely that any policies would impact on the duration of abstinence, which is the main outcome of interest here.

The finding that U.K. smokers report making fewer quit attempts than those in other countries has been reported previously by ITC researchers (Borland et al., 2009; Hyland et al., 2006), although the reasons for this remain unclear. It is possible that making a quit attempt is related to receiving advice to stop from a doctor and fewer U.K. smokers reported receiving such advice than smokers in other countries. This difference may also be partly due to the increased duration of individual quit attempts in the United Kingdom relative to the other three countries; individuals abstinent from smoking for extended periods of time naturally tend to have less opportunity to embark upon a new quit attempt. It may also be that the other countries have focused their activities more on motivating quit attempts, while the United Kingdom approach, with a greater emphasis on help through clinical services, might be more effective in helping smokers stay quit. As there is strong evidence that the determinants of making quit attempts and success of attempts (once made) are different (Hyland et al.), this is plausible. Unfortunately, it has proven difficult to date to compare levels of motivational activity across these four countries as a wide range of policy initiatives (including advertising campaigns, price increases, smoke-free laws, and comprehensive warnings on cigarette packets) combine to produce complicated synergistic effects. An earlier analysis of the predictors of making quit

**Table 5. Fraction of international differences in short-term (28 days) abstinence attributable to use of behavioral support and/or pharmacotherapy**

	Australia	Canada	The United States
$\alpha$ . Maximum likelihood estimate (MLE) of OR for 28-day abstinence relative to the United Kingdom (from Table 4)	0.59	0.72	0.51
$\beta$ . Proportional reduction in odds of 28-day abstinence from the U.K. level ( $1 - \alpha$ )	0.41	0.28	0.49
$\gamma$ . MLE of OR for 28-day abstinence relative to the United Kingdom, adjusted by support use	0.62	0.77	0.55
$\delta$ . Proportional reduction in odds of 28-day abstinence from U.K. level, adjusted by support use ( $1 - \gamma$ )	0.38	0.23	0.45
Fraction of reduction attributable to differences in support use ( $(\beta - \delta)/\beta$ ), %	7.3	17.9	8.2

Note. OR = odds ratio.

attempts using ITC data reported no major country differences with lower nicotine dependence, recent quit attempts, health worries, plans to quit, and an unfavorable attitude to smoking being key predictors (Hyland et al.).

Hyland et al. (2006) also found that longer duration of past quit attempts was a predictor of being more likely to make future quit attempts. This may help explain why there was no longer a difference in attempt rate across countries by Wave 4. Perhaps the greater use of treatment in the United Kingdom in earlier attempts resulted in longer periods of abstinence, which then encouraged repeat attempts by those who lapsed. If this is an accurate description of the mechanism/process, it would suggest that countries with more use of effective treatment will experience a gradual build up of more quit attempts and each attempt being more likely to be successful over time. Hyland et al. also found that making a quit attempt in the prior year was predictive of being more likely to make a future quit attempt. This would suggest that the United Kingdom should experience an ever-increasing reduction in quit attempts (starting from a lower baseline). The fact that this does not happen suggests that the effect of the longer duration of success with each attempt is stronger in encouraging future tries.

As expected, U.K. smokers were more likely to report using support when stopping than smokers in the other three countries. Other studies have observed that approximately half of U.K. smokers now use support when stopping, the most commonly used support being the purchase of NRT over the counter, with 3% using the stop smoking services (Kotz, Fidler, & West, 2009). These are in line with our own estimates, even though in the earlier waves, the services were at an early stage of development and we observed an upward trend in reports of support being used during our study. Data from the English NHS show that over the period of this study, the number of individuals setting target quit dates via NHS stop smoking services nearly doubled from 361,200 in 2003/2004 to 600,410 in 2006/2007 (The NHS Information Centre, n.d.). Total expenditure on NHS Stop Smoking Services and medication costs in the financial year 2008/2009 was £131.5m (The NHS Information Centre, 2009) but this includes some marketing, promotional and local wider tobacco control activity costs. The cost per quitter is therefore calculated from this amount as approximately £300—well below the threshold for cost-effective health care interventions in England (£30,000 per quality adjusted life year). It is likely, however, that this cost per quitter is an overestimate because of the other tobacco control activity costs which cannot be quantified separately.

From 2004, doctors in the United Kingdom were given a payment incentive (the GP contract) for asking about the smoking status of their patients, and offering advice to quit, which would be expected to increase the reports of intervening with smokers. This may explain why the observed levels of advice-giving (Table 2) and in numbers making at least one quit attempt (Table 3) appeared to increase in the United Kingdom (relative to the other countries) in successive surveys and is another possible reason why differences in the use of support appeared to increase over the same period (Table 3).

The finding that U.K. smokers were more likely to achieve short-term abstinence (28 days) was also in line with our hypothesis. Although the use of support increased the likelihood of short-term abstinence overall, this did not entirely explain the increased success of smokers in the United Kingdom. Further work is required to examine the reasons for the remaining disparity in detail and to assess whether abstinence rates remain different for longer term follow-ups. Given what we know about the consistency of relapse curves over time, we believe that the differential between smokers in the United Kingdom and the other three countries will remain over a longer term period.

In summary, our findings demonstrate that smoking cessation support is effective outside clinical trials in a range of international settings. In the United Kingdom (where support is most readily available), smokers' likelihood of remaining abstinent is enhanced, and there is no indication that smoking cessation support reduces the number of quit attempts.

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## Declaration of Interests

None declared.

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JEG, AM, and RLM designed the study with contributions and advice from RB, KMC, and GTF. JEG carried out the analyses and prepared the initial draft of the paper. All authors participated in the preparation of the final draft. The study protocol was reviewed and approved by the research ethics boards of the University of Waterloo (Canada), Roswell Park Cancer Institute (the United States), University of Strathclyde and University of Nottingham (the United Kingdom), University of Stirling (the United Kingdom), The Open University (the United Kingdom), and The Cancer Council Victoria (Australia).

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