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journal homepage: www.elsevier.com/puhe

Original Research

Factors associated with quit attempts and smoking cessation in Brazil: findings from the International Tobacco Control Brazil Survey

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ARTICLE INFO

Article history:
Received 14 January 2019
Received in revised form
30 May 2019
Accepted 8 June 2019
Available online 27 July 2019

Keywords:
Quit attempts
Smoking cessation
Adult
Brazil

ABSTRACT

Objectives: This study aimed to identify factors associated with attempting to quit and successful smoking cessation in a population-based sample of Brazilian smokers.
Study design: This is a prospective cohort study.
Methods: Data came from the first two waves of the International Tobacco Control Brazil Survey, conducted in 2009 and 2012/2013 in three cities: Rio de Janeiro, São Paulo, and Porto Alegre. Data were collected from 488 adults (aged ≥18 years) who smoked at Wave 1 and who were resurveyed at Wave 2. Crude and adjusted relative risks for two outcomes (making a quit attempt between Wave 1 and Wave 2 and successfully quitting by Wave 2) were estimated. Multivariable multilevel logistic regression models were used, whereby variables were added to the models in a series of blocks.
Results: Nearly two-thirds (65.6%) of smokers attempted to quit between waves, and 23.4% had quit at Wave 2. Intention to quit smoking at Wave 1 was the only variable associated with attempt to quit by Wave 2 (odds ratio [OR] = 2.85; 95% confidence interval [CI] 1.64–4.94; $P < 0.001$). Smokers of higher socio-economic status (OR high *versus* low = 1.80; 95% CI 1.05–3.10; $P = 0.03$) and lower nicotine dependence (OR low Heaviness of Smoking Index [HSI] *versus* high HSI = 1.94; 95% CI 1.10–3.43; $P = 0.02$) were more likely to successfully quit. The presence of another adult smoker at home was negatively related to successful quitting (OR = 0.50; 95% CI 0.26–0.94; $P = 0.03$).
Conclusions: These results are generally consistent with prior research and have potential to inform governmental interventions to promote tobacco cessation, particularly among disadvantaged groups.

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https://doi.org/10.1016/j.puhe.2019.06.004

Introduction

The World Health Organization's Framework Convention on Tobacco Control (FCTC) has been ratified by 181 parties (180 countries plus the European Union), including Brazil. Article 14 of the FCTC obligates parties to develop effective actions, including comprehensive diagnostic programs, counseling, prevention and treatment of tobacco dependence, to promote successful quitting among smokers and to facilitate the accessible and affordable treatments.[1] In this regard, Brazil has adopted a number of important measures. In May 2001, the Brazilian Ministry of Health launched a national toll-free telephone quit line service. In August 2004, a government ordinance[2] regulated the treatment of tobacco dependence in the National Health System, the *Sistema Único de Saúde* (SUS), which is available for free. Both bupropion and nicotine replacement therapies in the form of patch and gum became fully subsidized by the government since this time. The prevalence of smoking dropped nearly 50% between 1989 and 2010, and 46% of this reduction was attributable to measures related to the price of cigarettes increasing due to tax (Law 12,546/2011).[3,4] However, the extent to which this and other tobacco control policies have increased demand for cessation services is unclear.

A systematic literature review of eight studies of the predictors of attempts to stop smoking in adult general population found that motivational factors were the main predictors of quit attempts.[5] But additional research has identified a range of other factors associated with attempting to quit, including sociodemographic factors like having a higher monthly income[6–8] and a higher education level.[8,9] Environmental factors associated with quit attempts include having smoking restrictions at home,[10] as well as smoke-free policies in public places and workplaces.[6] Individual-level factors related to cessation include lower nicotine dependence,[7,8,11] having made a quit attempt in the past,[7,8,12,14,15] longer duration of past quit attempt,[7] and motivational variables such as higher self-efficacy to quit,[9,12,14] intention to quit,[6,7,12] wanting to quit,[16] higher motivation to quit,[8] and perceptions of good or excellent health.[12]

The predictors of successful smoking cessation include sociodemographic factors like relatively older age[6,12,14] and higher education level.[15] Individual-level factors associated with quit success include prior abstinence,[12,14,15] having made a quit attempt in the past,[6,11,15] intention to quit,[12,14,15] less nicotine dependence,[8,11,12] perceiving health as good or excellent,[6] and having relatively high self-efficacy.[6,12] However, the aforementioned systematic literature review indicates that only measures of nicotine dependence were consistently predictive of success of quitting in population-based studies, with greater success found among those with lower levels of dependence.[17]

Few studies have examined the factors related to smoking cessation in Brazil. One cross-sectional study of 11,393 smokers and former daily smokers aged 15 years or older found that older age, higher socio-economic status (SES) (higher income, internet access in the household, living in the more developed regions of the country, access to the health care system), awareness of health risks of smoking, and having physical activity were positively related to successful smoking cessation.[18] However, the cross-sectional nature of that study limits understanding of the causal relationships. Furthermore, that study did not assess the role of other potentially important variables, such as nicotine dependence, smoke-free policies, level of self-efficacy, and social acceptability of smoking. Another Brazilian study found that smokers from lower SES groups were less likely to see a physician and to receive smoking cessation advice from physicians.[17]

Population-based longitudinal data to identify specific factors related to quit attempts and successful smoking cessation in Brazil are needed to evaluate and optimize government strategies for treating tobacco dependence. This study is the first population-based longitudinal study of quit attempts and successful quitting in Brazil.

Methods

Sample

Data came from the first two waves of the International Tobacco Control (ITC) Brazil Survey (ITC-Brazil). ITC-Brazil is a population-based prospective cohort study to assess the impact of tobacco control policies in three cities: Rio de Janeiro, São Paulo, and Porto Alegre. Wave 1 was conducted between April and June 2009 among 1825 participants (two-thirds of smokers and one-third of non-smokers), who were recruited using random digit dialing. Among the 1215 smokers, 488 (40.2%) were successfully followed up at Wave 2, which was conducted between October 2012 and February 2013. A detailed description of sample selection and study protocols used by the ITC Brazil Survey has been published elsewhere.[17,19] In brief, the survey was conducted through telephone-administered questionnaires. In each city, a representative sample of 400 smokers was stratified according to each of the city areas. This sample size was large enough to obtain reliable estimates of the main assessed outcomes. In households with more than one eligible respondent, the next-birthday method of respondent selection was used to select a single respondent. No substitution within household was allowed, except when the chosen participant had been absent during the whole period of data collection. The household telephone contact rate was 31.7%, and only 14.8% of eligible smokers refused to participate.

Participant characteristics were compared for smokers who were and were not successfully followed up (supplementary Table 1). Those lost to follow-up were significantly more likely to be younger, from São Paulo or Porto Alegre (compared to Rio), and male ($P < 0.05$).

Eligible participants for this study were adults (aged ≥18 years) who smoked at Wave 1 (i.e., smoked at least 100 cigarettes in his or her lifetime and reported smoking at least once in the past 30 days). The ITC Brazil Survey and protocol was approved by the Brazilian National Cancer Institute Ethics Committee (Protocol 99/08) and by the Human Research Ethics Committee of the University of Waterloo.

Measurement

The outcomes assessed in this study were (1) making a quit attempt, defined as report of having made any attempt to quit

since Wave 1, and (2) quit successful at Wave 2, defined report of not having smoked at all for 30 days or more at the follow-up survey.

Sociodemographic variables measured at Wave 1 included the city of residence (Rio de Janeiro, São Paulo, and Porto Alegre); gender (female, male); age at recruitment (in years, classified as 18–24, 25–39, 40–54, and 55+); self-reported race/ethnicity (classified according to the National Census Bureau—*Instituto Brasileiro de Geografia e Estatística*—as white and non-white); education (in years of schooling, classified as ≤ 8 years, 9–11 years, ≥ 12 years); marital status (categorized as married, separated/divorced, widowed, and single); current employment status (employed, not employed); and monthly income based on minimum wages (MWs). One MW is the lowest legal remuneration due and paid by the employer to employees for a normal month of service in Brazil. On June 30, 2009, 1 MW = R$ 465 = US$ 238; there were four categories: <476 US$; 476–1189 US$; 1190–4759 US$; and ≥4760 US$. An SES composite measure combined income and education into a three-category scale: low, moderate, and high, following from Licht et al.[20] Participants with low education (<12 years of schooling) and low income (less than 5 MW) were considered having low SES. Those with any combination of moderate or high education (≥12 years of schooling) and income (≥5 MW) were classified as having high SES. All other combinations were classified as moderate SES. Intermediate and high SES were grouped into a single category based on their distribution in regard to outcome measures.

Measurement of environmental norms about smoking included other adult smokers in the home (no *versus* yes); home smoking ban (smoking is never allowed in any indoor area *versus* smoking is allowed anywhere inside your home/smoking is allowed in some rooms inside your/smoking is not allowed inside your home except under special circumstances at home); workplace smoking ban (smoking is not allowed in any indoor area *versus* smoking is allowed only in some indoor areas/smoking is allowed in any indoor areas *versus* works outside only); and perceived societal disapproval of smoking (strongly agree/agree *versus* neither agree nor disagree/disagree/strongly disagree).

Dependence was assessed by asking smoking frequency ('daily', 'non-daily'), the number of cigarettes per day (recoded to 1–10, 11–20, 21–30, and ≥31 cigarettes/day), and the time to first cigarette after waking (≤15, 15–30, 31–60, and >60 min). Nicotine dependence was assessed using the Heaviness of Smoking Index (HSI), a six-point scale calculated from the number of cigarettes per day (1–10, 11–20, 21–30, ≥31 cigarettes) and the time to first cigarette after waking (≤15, 15–30, 31–60, and >60 min). Because the distribution was skewed, the HSI was recoded into three categories: low (HSI 0–1), medium (HSI 2–4), and high (HSI 5–6).[21,22] Medium and high HSI were grouped into a single category based on their distribution in regard to outcome measures.

Measurement of motivational factors included perceived addiction ('Do you consider yourself addicted to cigarettes?': 'not at all addicted'; 'yes, somewhat addicted'; and 'yes, very addicted'), intention to quit smoking in the next six months, and level of self-efficacy ('If decided to give up smoking completely in the next 6 months, how sure are you that you would succeed' coded as low = not at all/slightly/moderately sure *versus* high = very/extremely sure). At follow-up, participants were asked about the number of times that the person tried to quit between surveys.

Other variables included in the study were perceived health (poor/average *versus* good/very good/excellent) and practice of physical activity (yes *versus* no). Environmental, motivational, and dependence-related questions were posed at Wave 1.

Data analysis

Descriptive analysis was performed to determine frequency distribution of the categorical variables. Chi-squared tests were used to assess bivariate associations between categorical variables with the outcome measures, estimating crude relative risk and 95% confidence intervals (CIs). Independent variables associated with quit attempts between waves and successfully quitting at follow-up were explored using a multilevel analysis approach, as described in the following section. Factors with $P < 0.20$ in the univariate analysis were considered for inclusion in the model using a stepwise approach. In the multilevel analysis of variables associated with quit attempts, distal level sociodemographic variables (e.g., age, SES, city) were entered as a block (Model 1). Next, environmental norms about smoking were included as an intermediate level block of variables (Model 2). Finally, measures of nicotine dependence and motivational factors were included (Model 3). In the multilevel analysis of variables associated with quit success, the same strategy was followed; however, Model 3 also included the number of attempts to quit between waves. As the variable income and education were collinear with SES, only SES was included in the adjusted models. Missing data were not considered in the analysis. P-values < 0.05 were considered statistically significant. The Statistical Package for the Social Sciences (SPSS V.21) was used for all analyses.

Results

The overall response rate for the survey was 40.2%. The 488 followed-up smokers were predominantly from Rio de Janeiro (38.5%) and female (61.3%). The majority were married (52.9%), employed (35.0%), and had ≥ 9 years of education (69.6%) (Table 1). In addition, most of the participants smoked daily (93.6%), 11 to 20 cigarettes a day (47.7%), smoked their first cigarette less than 30 min after waking (63.4%), and considered themselves to be very dependent on cigarettes (57.6%). For the majority, the dependence level (HSI) was low or medium (78.1%), no other adults smoked at home (74.3%), and they could not smoke at work (70.5%) (Table 2). Approximately two-thirds (65.6%) of smokers made a quit attempt between the waves, and the rate of successfully quitting by follow-up was 23.4% (29.8% quit 1–6 months ago; 25.4% quit >6–12 months ago; and 44.7% quit >12 months ago). Univariate analysis is shown in supplementary Table 2. In the multilevel analysis, only 'intention to quit smoking' was associated with having made a quit attempt (Table 3). Smokers with moderate/high SES and lower nicotine dependence had an independent statistically significant association with quitting; the presence of any other adult smoker at home was inversely related to quitting successfully (Table 4).

Table 1 – Demographic characteristics (n = 488).

Variables	N	%
City		
Rio de Janeiro	188	38.5
São Paulo	147	30.1
Porto Alegre	153	31.4
Sex		
Male	189	38.7
Female	299	61.3
Age at recruitment		
18–24 years	33	6.8
25–39 years	106	21.7
40–54 years	235	48.2
≥55 years	114	23.4
Race/ethnicity		
White	282	57.8
Non-white	205	42.0
Missing	1	0.2
Education		
≤8 years	145	29.7
9–11 years	192	39.3
≥12 years	148	30.3
Missing	3	0.6
Marital status		
Married	258	52.9
Separated/divorced	61	12.5
Widowed	35	7.2
Single	128	26.2
Missing	6	1.2
Current employment		
Employed	171	35.0
Not employed	298	61.1
Missing	19	3.9
Income[a]		
<476 US$	85	17.4
476–1189 US$	205	42.0
1190–4759 US$	142	29.1
≥4760 US$	22	4.5
Missing	34	7.0
Socio-economic status		
Low	245	50.2
Moderate	121	24.8
High	78	16.0
Missing	44	9.0

[a] At that time, 1 Brazilian minimum wage = US$ 238.27.

Table 2 – Smoking related characteristics (n = 488).

Variables	N	%
Smoking status		
Daily	457	93.6
Non-daily	31	6.4
Nicotine dependence (HSI) at baseline		
Low (HSI <2)	135	27,7
Medium (HSI = 2 to 4)	292	59,8
High (HSI ≥4)	39	8,0
Missing	22	4,5
Perceived addiction		
Not at all addicted	37	7.6
Yes, somewhat addicted	168	34.4
Yes, very addicted	281	57.6
Missing	2	0.4
Presence of any other smoker at home (≥18 years)		
No smokers	356	73.0
>1	129	26.4
Missing	3	0.6
Smoke at home		
Smoking is allowed[a]	304	62.3
Smoking is not allowed in any indoor area	182	37.3
Missing	2	0.4
Smoke in the workplace		
Smoking is not allowed	216	44.3
Smoking is allowed[b]	63	12.9
Works outside only	32	10.2
Do not know	2	0.4
Do not work	175	35.9

HSI, Heaviness of Smoking Index.
[a] Smoking is allowed: anywhere inside home/in some rooms inside/is not allowed inside home except under special circumstances at home.
[b] Smoking is allowed only in some indoor areas or smoking is allowed in any indoor areas.

Discussion

This study of a probability sample of smokers in Brazil found that nearly two-thirds (65.6%) of smokers made a quit attempt between 2009 and 2012 and that 23.4% had successfully quit by follow-up. The percentage of smokers who make quit attempts over similar periods of time varies substantially across countries (25–48%).[17] In the United States, 40% of smokers make a quit attempt annually, with no changes in this rate over recent years.[5] By contrast, quit attempt rates were substantially lower in Mexico (17% over 14 months).[11]

The only independent variable associated with making a quit attempt between survey waves was intention to quit smoking. Previous research has shown similar results,[6,7,12,13,23] which are also consistent with expectations from theoretical models that posit that behavior change is channeled through intentions.[24,25] What is perhaps most surprising from our study is that intention was associated with making a quit attempt even over a three-year period of follow-up. However, we did not find a statistically significant association with making a quit attempt for other classic variables, such as sociodemographic characteristics (age,[6,7] income,[6,8] education level,[8,9] and place of living and working[6]), smoking policies (restrictions at home and work[14]), self-rated health,[12] and motivational factors (wanting to quit and frequency of prematurely butting out cigarettes[6–9,11–15]). Indeed, these factors were unassociated with quit attempts even in models that did not include quit intention. Hence, their lack of association does not appear to be due to differing intentions to quit across different levels of these factors.

It should be noted, however, that a number of these classic variables were trending in the expected direction but failed to achieve statistical significance. This may be due to the lower sample size of this study, especially for the analyses on successful quitting, where the N was around 100, about one-quarter the sample size of the ITC Four Country Survey. As a result, there may well have been a number of Type II errors.

Our models found a consistent, independent relationship between relatively higher SES and successful cessation, which is consistent with some other studies,[6,8,26,27] although some other studies have found no association with education[7,12,26,27] or income.[7,12] According to Kaleta et al.,[27] the correlation between the higher educational level and successful cessation is due to the

Table 3 – Results of the multivariable multilevel analysis for quit attempts.

Variables	Model 1		Model 2		Model 3	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Sex						
Female	1.0 (reference)		1.0 (reference)		1.0 (reference)	
Male	1.24 (0.83–1.85)	0.22	1.29 (0.86–1.94)	0.22	1.25 (0.80–1.94)	0.17
Age at recruitment						
18-24 years	1.0 (reference)		1.0 (reference)		1.0 (reference)	
25-39 years	0.77 (0.34–1.76)	0.51	0.76 (0.33–1.73)	0.51	0.72 (0.30–1.72)	0.46
40-54 years	1.04 (0.48–2.24)	0.97	1.02 (0.47–2.22)	0.97	1.08 (0.48–2.45)	0.85
≥55 years	0.58 (0.25–1.32)	0.19	0.57 (0.24–1.32)	0.19	0.62 (0.25–1.50)	0.29
Marital status						
Married	1.0 (reference)		1.0 (reference)		1.0 (reference)	
Unmarried	0.69 (0.47–1.01)	0.14	0.74 (0.50–1.10)	0.14	0.79 (0.52–1.21)	0.28
Smoke at home						
Allowed	–		1.0 (reference)			
Not allowed	–		1.33 (0.86–1.99)	0.17	1.21 (078–1.87)	0.40
Perceived societal disapproval of smoking						
Strongly agree/agree	–		1.0 (reference)		1.0 (reference)	
Neither agree nor disagree/disagree/strongly disagree	–		1.39 (0.88–2.19)	0.16	1.47 (0.88–2.43)	0.14
Intention to quit smoking						
No intention to quit	–		–		1.0 (reference)	
Next month/next 6 months/beyond 6 months	–		–		2.85 (1.64–4.94)	**0.001**

OR, odds ratio; CI, confidence interval.
Statistically significant associations are indicated in bold.

higher knowledge about smoking-related health risks and stronger antismoking attitudes and social norms. Although norms were unassociated with outcomes in our study, they may have changed in the interval between survey waves, given implementation of smoke-free policies and a tobacco tax. Our results suggest that interventions in Brazil must continue to consider socio-economic disparities in smoking, even though recent nationally representative surveys indicate that socio-

Table 4 – Results of the multivariable multilevel analysis for successful quitting.

Variables	Model 1		Model 2		Model 3	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
City						
Rio de Janeiro	1.0 (reference)		1.0 (reference)		1.0 (reference)	
São Paulo	0.82 (0.49–1.39)	0.47	1.40 (0.80–2.46)	0.24	1.31 (0.68–2.53)	0.43
Porto Alegre	1.11 (0.62–1.99)	0.72	1.17 (0.69–1.99)	0.57	1.25 (0.66–2.34)	0.50
Socio-economic status						
Low	1.0 (reference)		1.0 (reference)		1.0 (reference)	
Moderate/high	1.56 (1.00–2.44)	**0.04**	1.63 (1.03–2.57)	**0.04**	1.80 (1.05–3.10)	**0.03**
Smoke at home						
Allowed	–		1.0 (reference)		1.0 (reference)	
Not allowed	–		1.62 (1.02–2.57)	**0.04**	1.12 (0.64–1.97)	0.68
Presence of another smoker at home (≥18 years)						
No	–		1.0 (reference)		1.0 (reference)	
Yes	–		0.60 (0.34–1.05)	0.07	0.50 (0.26–0.94)	**0.03**
Dependence nicotine (HSI)						
Medium/high	–		–		1.0 (reference)	
Low	–		–		1.94 (1.10–3.43)	**0.02**
Perceived health						
Poor/average	–		–		1.0 (reference)	
Good/very good/excellent	–		–		1.22 (0.64–2.34)	0.55
Number of attempts to quit between waves						
2 or + attempts	–		–		1.0 (reference)	
1 attempt	–		–		1.55 (0.61–3.90)	0.36
Level of self-efficacy for quitting						
Low	–		–		1.0 (reference)	
High	–		–		1.14 (0.66–1.97)	0.63

OR, odds ratio; CI, confidence interval; HSI, Heaviness of Smoking Index.
Statistically significant associations are indicated in bold.
Model 1: distal level - socio-demographic variables (e.g., age and city); Model 2: intermediate level (e.g., environmental norms about smoking; Model 3: proximal level (e.g., measures of nicotine dependence, motivational factors and number of attempts to quit between waves).

economic disparities are diminishing—probably due to tax increases that have a larger impact among lower income populations that are more sensitive to price increases.[28]

Consistent with previous studies,[11,12,14] lower nicotine dependence was associated with successful quitting. Indeed, a systematic literature review found that cigarette dependence is the most consistent predictor of quit success.[5] Similar to our results, Kale et al.[29] proposed that while determination to quit is necessary to prompt an attempt to quit smoking, greater nicotine dependence can nevertheless impede successful quitting. Most smokers try to quit without assistance, such as stop smoking services or medications, and those who are more dependent are less likely to be successful without such assistance.[25] Although Brazil has eliminated some barriers to cessation assistance, it appears that further efforts may be necessary to promote their use. Future research should explore the use of cessation supports to determine their utility, including across different SES groups.

Finally, our results suggest that the presence of any other adult smoker at home reduced the chances of successfully quitting. Other studies have found that having a partner who smokes impedes smoking attempts. Smokers whose partners also smoke perceive smoking as normal behavior, which appears to reduce intentions to quit,[24,30] and the social cues from smoking behavior may also promote relapse among those who are trying to quit. Research is needed on how best to intervene with couples in order to motivate them to quit, as the strategies for doing this may be somewhat different from those that work for smokers whose partners do not smoke.[31]

Some limitations of the present study should be mentioned. First, the loss to follow-up ranged from 30.1% in São Paulo to 38.5% in Rio de Janeiro, and those who were not successfully followed-up were younger and more likely to be female (P-value < 0.05). Given that city, age, and sex were not associated with quitting behaviors, these baseline differences appear unlikely to have seriously biased study results. By contrast, people who were not followed-up were more likely to prohibit smoking in the home, which we found to be associated with greater likelihood of quitting; hence, this selection bias may have led to an underestimate of effects because some people who were more likely to quit did not contribute data to the study. Second, measurement of quit behavior relied on self-report and was not biochemically validated. The lack of anonymity could have promoted socially desirable responding, although such effects are likely to have been minimal due to querying legal behavior. Nevertheless, recall may have been biased for reporting quit attempts that took place in the three years between surveys. It is unclear, however, how this may have biased study results. Another potential limitation of the study is that the data used were collected more than 5 years ago. However, one can argue that the results remain current because there have been no major changes in national tobacco control policies and consequently in the lifestyle of the studied population. Finally, our measure of quit success included everyone who had quit for 30 days or more, and some of these participants may have relapsed. However, most people (70.1%) reported having been quit for more than 6 months, for whom relapse is less likely.

As mentioned previously, owing to the small sample size, relative to other ITC studies, and so some of the tests that failed to reach statistical significance may have been due to this lower statistical power.

Other limitations concern the inability to generalize study results to the whole country, as it was conducted only in three major cities located in the more developed region of Brazil. The sampling frame was also limited to adults who had a landline phone at home. Consequently, the lower income segment of society, which was less likely to a have landline at home, is likely to have been excluded differentially from the study. Still, the results can provide a reasonable description of cessation behavior among non-clinical urban populations, and most of Brazil lives in cites (84.4%).[32] Nevertheless, future research should consider rural populations. Finally, other variables associated with cessation behavior (e.g., negative attitudes about smoking, other drug use, psychiatric comorbidity and belonging to a religious affiliation[7,9,13]) were not included in the present analysis. As a result, the study may be subject to omitted variable bias. Although the exclusion of significant variables may have caused poor model specification, our results are generally consistent with prior research in other countries, suggesting that cessation behavior operates similarly in Brazil as in other countries and cultural contexts. The regional significance of the findings cannot be ignored.

Despite these limitations, this study provides important information, given that it is the first population-based longitudinal study to assess the variables associated with quit attempts and quit success in Brazil. Furthermore, our modeling approach is unique and can provide direction to forthcoming government interventions to promote tobacco cessation. Finally, the ITC Brazil Survey findings can provide important support for guiding tobacco control policies in the country.

Author statements

Acknowledgments

The authors are grateful to the Project Management Staff (Janine Ouimet and Anne C.K. Quah) of the ITC Project at the University of Waterloo for their contributions on all aspects of the ITC Brazil survey. They would also like to thank the team members of the Data Management Center of the ITC Project at the University of Waterloo, including Christian Boudreau, Pete Driezen, Ruth Loewen, and Mary E. Thompson. Thanks are also due to the technical staff from expertise who conducted the fieldwork.

Ethical approval

The ITC Brazil Survey and protocol was approved by the Brazilian National Cancer Institute Ethics Committee (Protocol 99/08) and by the Human Research Ethics Committee of the University of Waterloo.

Funding

The ITC Brazil waves 1 and 2 project was supported by the Brazilian Ministry of Health- Brazilian National Cancer Institute, Brazilian Ministry of Justice- National Secretariat for

Drug Policy (SENAD), and the Canadian Institutes of Health Research (115016).

Competing interests

No conflict declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.06.004.