BRAZIL

WAVE 1 and Wave 2
TECHNICAL REPORT

July 2013

ITC Brazil Country Investigators
Cristina de Abreu Perez* (National Cancer Institute of Brazil)
André Szklo (National Cancer Institute of Brazil)
Tânia Maria Cavalcante (National Cancer Institute of Brazil)
Letícia Casado Costa (National Cancer Institute of Brazil)
Liz Almeida (National Cancer Institute of Brazil)
Felipe Mendes (National Cancer Institute of Brazil)
Mariana Pinho (National Cancer Institute of Brazil) – Wave 2
Eliane Volchan (Federal University of Rio de Janeiro) - Wave 1
Billy E.M. Nascimento (Federal University of Rio de Janeiro) - Wave 1
Paula Johns (Alliance for the Control of Tobacco Use)
Daniela Guedes (Alliance for the Control of Tobacco Use)
Valeska Carvalho Figueiredo (Oswaldo Cruz Foundation)
Vera Lúcia da Silva Colombo (Oswaldo Cruz Foundation) – Wave 2
Cristiane Galhardo Ferreira Vianna (Int'l Union Against Tuberculosis and Lung Disease)

International Planning Group
Geoffrey T. Fong* (Dept. of Psychology, University of Waterloo)
Mary E. Thompson (Dept. of Statistics and Actuarial Science, University of Waterloo)
Christian Boudreau (Dept. of Statistics and Actuarial Science, University of Waterloo)
Janine Ouimet (Dept. of Psychology, University of Waterloo)
Amanda Duncan (Dept. of Psychology, University of Waterloo)
Mary McNally (Dept. of Psychology, University of Waterloo)
Natalie Sansone (Dept. of Psychology, University of Waterloo)
James F. Thrasher (University of South Carolina and Instituto Nacional de Salud Publica, México)
Ernesto Sebrié (Roswell Park Cancer Institute)

**Principal Investigators*

Funding
The ITC Brazil Project has received funding support from:

National Cancer Institute of Brazil
National Secretariat for Drug Policy, Brazil
Alliance for the Control of Tobacco Use
Canadian Institutes of Health Research
U.S. National Cancer Institute

Table of Contents

Introduction

Background
The International Tobacco Control (ITC) Project is a prospective cohort survey designed to evaluate national level tobacco control policies. Since the ITC Project started, the ITC survey has been administered in a number of countries such as: the United States, Canada, Australia, the United Kingdom, Ireland, China, Thailand, Malaysia, New Zealand, Sout Korea, Mexico, Uruguay, Germany, France, Netherlands, India, Bangladesh, Mauritius, and Bhutan.

The ITC Brazil survey is a telephone survey of a cohort of approximately 1200 adult smokers and 600 adult non-smokers representative of three cities in Brazil: Rio de Janeiro, São Paulo, and Porto Alegre. The first wave of the ITC Brazil survey was conducted from April to June of 2009, and the second wave from October 2012 to February 2013. The information contained in this report is from both Wave 1 and Wave 2 of the ITC Brazil Survey.

The objectives of the ITC Brazil survey are:

To evaluate the impact of the Brazilian pictorial warning labels.

The ITC Brazil survey measures whether the old and/or new pictorial warning labels induce thoughts among smokers about risk attributed to those labels, the effectiveness of the current warning labels, and the impact of the new and old warning labels on intentions to quit smoking and quitting behavior.

To evaluate the impact of smoke-free initiatives, both cross-sectionally and longitudinally across the four cities in the survey.

The ITC survey measures exposure to secondhand smoke in key venues (public transportation, cinemas, etc) and determines support for smoke-free laws in those venues among smokers and non-smokers and compare support before and after the implementation of smoke-free bans.

To evaluate factors that could influence smoking attitudes and behavior

This study provides very detailed information about smokers' quitting behaviour, consumption patterns, and other important aspects of smoking behaviour.

To compare smoking behaviour and the impact of policies between Brazil and other ITC countries.

The ITC survey is being administered in 20 countries. Because most of the questions are the same, we will be able to compare patterns of smoking and policies in Brazil and each of the 19 other countries.

Survey Design

The ITC Survey is a longitudinal cohort study. In other words, the respondents who participate in this survey will be re-contacted in the future to answer follow-up surveys. [Already mentioned a few lines above.]

The Research Team

The ITC Brazil Project is a collaborative project between the ITC Project at the University of Waterloo, led by Geoffrey T. Fong as Principal Investigator; and the Brazilian National Cancer Institute (INCA), led by Cristina de Abreu Perez as Principal Investigator. INCA, part of the Brazil Ministry of Health, has a mandate to develop and coordinate the National Policy on cancer prevention and control in Brazil. Within this context, INCA has coordinated the National Tobacco Control Program since 1989 with the aim of reducing smoking prevalence and consequently the burden of tobacco related diseases and deaths. Additional members of the ITC Brazil team are associated with the Alliance for the Control of Tobacco Use (ACTbr), the Federal University of Rio de Janeiro, the Oswaldo Cruz Foundation, and the International Union against Tuberculosis and Lung Disease.

Map of Brazil

Sampling Design

Target Population

Respondents were adult smokers and non-smokers, aged 18 years or older. Smokers were defined as those who smoked more than 100 cigarettes in their lifetime, and smoked at least once in the past 30 days at recruitment. Non-smokers were defined as those adults NOT meeting the criterion for smokers, described above. Individuals in jail and those living in institutions were ineligible for the survey.

Sampling design

The ITC Brazil Survey is a prospective longitudinal study, and its sampling design was chosen to yield representative random samples of adult smokers and non-smokers residing in the cities of Rio de Janeiro, São Paulo, and Porto Alegre. At Wave 1, households were randomly selected using systematic sampling from an electronic phone number directory. The 1825 who participated in Wave 1 were called for follow-up interviews at Wave 2. All interviews were conducted using computer assisted telephone interview (CATI) system.

Sampling Frame

The telephone sample in each city was taken by systematic sampling from a comprehensive electronic directory of listed residential land lines provided by the Brazilian research firm Expertise. Within each of the three cities, households were randomly called until the quotas of 400 smokers and 200 non-smokers were achieved.

Sample Size

The Wave 1 ITC Brazil Survey included a total sample size of 1825 - 1215 adult smokers and 610 adult non-smokers.

In Wave 2, a total of 1830 respondents were interviewed - 1222 adult smokers and 608 non-smokers. Of the total 1830, 755 were cohort respondents who participated in Wave 1 and 1075 were newly recruited for Wave 2.

Table 1. Sample Sizes in the ITC Brazil Wave 1 and Wave 2 Surveys

	Wave 1 (n= 1825)				Wave 2 (n=1830)			
	Smokers		Non-smokers		Smokers		Non-smokers	
City	Male	Female	Male	Female	Male	Female	Male	Female
Rio de Janeiro	168	242	71	134	139	258	69	132
São Paulo	185	218	77	126	154	268	61	142
Porto Alegre	166	236	75	127	136	267	69	135
TOTAL	519	696	223	387	429	793	199	409

Survey Development

The ITC Brazil survey was first developed collaboratively by the Waterloo and Brazil teams in English. Both smoker and non-smoker versions of the questionnaires were developed containing common measures of tobacco use found in all ITC country surveys; including historical and current behaviour, addiction/dependence, beliefs and attitudes about smoking, knowledge about smoking related diseases, and perceived risk. The surveys were translated into Brazilian Portuguese by the project manager in Brazil with the Waterloo project manager providing assistance to ensure the meaning of the questions were understood. A Waterloo-based Portuguese translator then reviewed the English to Portuguese translation for accuracy.

The Wave 2 questionnaires were generally based on the Wave1 survey, but included the addition, deletion, and editing of some questions.

Protocols and Quality Control

Sampling Procedure

For Wave 1, within each of the three cities, households were randomly called through a systematic sampling method until the planned 400 smokers and 200 non-smokers were interviewed. One respondent from each household was selected for an interview.
In households with multiple eligible respondents, the next birthday method was used to select a single respondent. No substitution within the household was allowed. Once non-smoker quotas were filled, only smokers were recruited. A minimum of 5 call backs were conducted before retiring the household. To avoid call-scheduling bias, recruitment calls were conducted at various times of the day and on different days of the week.

For Wave 2, cohort respondents were re-contacted for follow-up, and any loss of the cohort was filled with newly recruited smokers and non-smokers as needed. Smokers from Wave 1 who had quit between waves were still eligible, being routed through the survey to answer questions designed for quitters. A minimum of 20 calls were made to re-interview each Wave 1 respondent.

Interview Protocol

The Brazilian team oversaw the survey fieldwork of the ITC Brazil survey, hiring the research firm Expertise to conduct the interviews.

Recruitment - At the beginning of the call, interviewers introduced themselves and the study, and asked to interview the adult with the next birthday. When the non-smoker quota was reached, the interviewer asked to interview the adult *smoker* with the next birthday. Respondents were qualified by their responses to the first part of the cohort survey which included their age, and for smokers, their smoking history.

Those who qualified and agreed to participate then participated in the main survey on the same call. Those who agreed to participate but could not complete the survey during the same call were scheduled for a future call in which the cohort survey was administered. The protocols and scripts prepared for Expertise, our survey firm in Brazil, were the same as those used in the ITC Four Country Survey, ITC France and ITC Germany. Messages were not left on answering machines.

Recontact – Cohort respondents who participated in Wave 1 were re-contacted by phone at the beginning of Wave 2. Respondents were given the choice to answer the main survey at the time of the recontact call or to schedule and alternative appointment. For recontact respondents, a message was left on the answering machine on the 1st and 6th call of each of the 2 weeks in which that respondent is being actively followed.

Length of Interview

This information was not retrievable by the survey firm.

Compensation

In a departure from usual practice in the ITC Surveys, respondents were not compensated for their time, because such compensation would violate ethics requirements in Brazil.

Disposition Codes

Call logs were kept separately for recontact respondents and replenishment respondents. Each line on the call log contained: respondent ID, city, date of call, time call started, duration of call, interviewer ID, and the disposition code. The following list of disposition codes were used by Expertise in recording outcomes for the call log:

Disposition Codes	
DMC Code	**Description**
CS 00	number not in service
CS 01	FAX/modem
CS 03	non-residential
CS 04	cell phone/mobile phone
CS 08	NBD* completes screened, but hangs up before end of interview
CS 09	NBD* completes recruitment script (i.e., R survey), with no skips
CS 10	callback: call again (firm appointment) to speak with adult to complete introduction
CS 11	callback: call again (soft appointment) to speak with adult to complete introduction
CS 12	appointment with NBD* to complete screener
CS 13	initial respondent makes appiontment for NBD*
CS 18	initial respondent refuses to give household composition (i.e., number of adults and number of smokers)
CS 19	no adult (i.e., 18 or older, depending on the country)
CS 20	no adult smoker, but household size (i.e., number of adults) given
CS 21	no adult smoker, but household size (i.e., number of adults) refused
CS 22	initial respondent refuses, but provides the number of smokers in household
CS 24	child says no adult smoker; household size unknown
CS 27	NBD* refuses before screener
CS 28	initial respondent refuses to get NBD*
CS 29	NBD* unavailable this wave
CS 30	NBD* refuses to give date of birth/age
CS 31	NBD* smoker refuses to anser 100 cigarettes question (BK501)
CS 32	NBD* smoker too young; no others
CS 33	NBD* smoker < 100 cigarettes in lifetime (BK501); no others
CS 34	NBD* smoker smokes < monthly (i.e., rSmoke > 3); no others
CS 35	NBD* refuses at consent
CS 40	rings only
CS 41	busy; no answering machine
CS 42	answering machine; not clear if residential

CS 43	answering machine; residential
CS 44	number reached, but unknown if residential
CS 80	initial respondent hangs up in intro
CS 81	NBD* hangs up during screener/consent
CS 82	initial respondent listen to intro, but hangs up before transferring call to NBD*
CS 84	NBD* completes screener, skips some questions afterwars, but reaches end
CS 85	NBD* completes survey, except for income question
CS 90	interviewer termination: initial respondent has language problem
CS 91	interviewer termination: initial respondent is incompetent
CS 92	interviewer termination: other problem with initial respondent
CS 93	interviewer termination: NBD* has language problem
CS 94	interviewer termination: NBD* is incompetent
CS 95	interviewer termination: other problem with NBD*

* NDB = Next Birthday respondent; usually a smoker, but could be a non-smoker if survey includes non-smokers

Cooperation and Response Rates for Respondents Recruited at Wave 1 of ITC-Brazil

Numbers in grey boxes (column D) must be inputted; all other calculations are automated.

Last updated on: Jun. 24, 2013

by: C. Boudreau & G. Li

Disposition codes			
DMC	**AAPOR**	**Freq.**	**%**
CS 00	4.30	53,230	53.6%
CS 01	4.20	741	0.7%
~~CS 02~~	4.40	0	0.0%
CS 03	4.50	7,780	7.8%
CS 04	4.42	0	0.0%
CS 08	2.12	104	0.1%
CS 09	1.1	1,826	1.8%
CS 10	2.21	3,587	3.6%
CS 11	2.21	0	0.0%
CS 12	2.21	935	0.9%
CS 13	2.21	94	0.1%
CS 18	3.212*	168	0.2%
CS 19	4.70	16	0.0%
CS 20	4.70	5,213	5.2%
CS 21	4.70	5	0.0%
CS 22	3.211*	7	0.0%
CS 24	4.70	0	0.0%
CS 27	3.211*	83	0.1%
CS 28	3.211*	17	0.0%
CS 30	3.211*	22	0.0%
CS 31	3.211*	100	0.1%
CS 32	4.70	12	0.0%
CS 33	4.70	0	0.0%
CS 34	4.70	2	0.0%
CS 35	2.11	83	0.1%
CS 40	3.13	9,382	9.4%
CS 41	3.12	13,821	13.9%
CS 42	3.14	728	0.7%
CS 43	3.212*	440	0.4%
CS 44	3.10	0	0.0%
CS 80	3.212*	779	0.8%
CS 81	3.211*	0	0.0%
CS 82	3.212*	0	0.0%
CS 83	1.2	0	0.0%
CS 84	1.2	0	0.0%
CS 90	3.212*	12	0.0%
CS 91	3.212*	14	0.0%
CS 92	3.212*	9	0.0%
CS 93	2.33	4	0.0%
CS 94	2.32	97	0.1%
CS 95	2.35	33	0.0%
	Total:	99,344	100%

Summary of disposition codes			
AAPOR Code	**Description**	**Freq.**	**%**
N/A	**Total sample with final disposition**	**99,344**	**100.0%**
1.0	**Interview**	**1,826**	**1.8%**
1.1	Complete interview (I)	1,826	**1.8%**
1.2	Partial interview (P)	0	**0.0%**
2.0	**Eligible, but not-interviewed (E)**	**4,937**	**5.0%**
2.10	Refusal & break-off (R)	187	**0.2%**
2.11	Refusal	83	**0.1%**
2.12	Break-off (BO)	104	**0.1%**
2.21	Non-contact (NC)	4,616	**4.6%**
2.30	Other (O)	134	**0.1%**
3.0	**Unknown eligibility, not-interviewed**	**25,582**	**25.8%**
3.10	Unknown if housing unit (UH)	23,931	**24.1%**
3.21	Housing Unit, but no screener completed (NS)	1,651	**1.7%**
3.211*	NS, but known that adult smoker in household (NS1)	229	**0.2%**
3.212*	NS, but unknown if adult smoker in household (NS2)	1,422	**1.4%**
4.0	**Not Eligible**	**66,999**	**67.4%**
	Multiple AAPOR codes (see corresponding colour in column C)	61,751	**62.2%**
4.70	No eligible respondent (NR)	5,248	**5.3%**
		99344.0	

* AAPOR code created by DMC

Revised number of non-contacts (by accounting that some were not eligible)	
e1 x (CS10 + CS11)	**2020**
e2 x (CS12 + CS13) = e2 x (NC - CS10 - CS11)	**1022**
Revised non-contact (revNC)	**3041**

Computed rates from disposition codes	
Eligibility rate (overall)	**56.3%**
e1 = (I + P + E)/(I + P + E + NR)	
Eligibility rate (after completion of screener)	**99.3%**
e2 = 1 - (CS32 + CS33 + CS34)/(I + P + BO)	
Estimated proportion of household phone numbers	**82.9%**
e3 = 1- (4.42* + 4.50*)/(I + P + E + UH + NS + NR + 4.42* + 4.50*)	
Cooperation rate (AAPOR COOP4)	**90.7%**
COOP4 = (I + P)/(I + P + R)	
Response rate (AAPOR RR4)	**10.5%**
RR4 = (I + P)/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	
Response rate (excluding Other = 2.30*)	**10.6%**
RR4 = (I + P)/(I + P + R + revNC + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	
Refusal rate (AAPOR3)	**1.1%**
REF3 = R/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	
Non-contact rate (1 - AAPOR CON2)	**87.6%**
1 - CON2 = 1 - (I + P + R + O)/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	

* These are AAPOR codes 2.30, 4.42 and 4.50; not numbers.

For more information on AAPOR consult http://www.aapor.org

Cooperation and Response Rates for Respondents Recruited in Wave 2 of ITC Brazil
(All 3 cities combined)

Numbers in grey boxes (column D) must be inputted; all other calculations are automated.

Last updated on: Jun. 26, 2013
by: C. Boudreau

Disposition codes			
DMC	**AAPOR**	**Freq.**	**%**
CS 00	4.30	2,313	21.2%
CS 01	4.20	14	0.1%
~~CS 02~~	4.40	———	———
CS 03	4.50	288	2.6%
CS 04	4.42	51	0.5%
CS 08	2.12	0	0.0%
CS 09	1.1	1,075	9.8%
CS 10	2.21	39	0.4%
CS 11	2.21	441	4.0%
CS 12	2.21	38	0.3%
CS 13	2.21	141	1.3%
CS 18	3.212*	65	0.6%
CS 19	4.70	45	0.4%
CS 20	4.70	535	4.9%
CS 21	4.70	0	0.0%
CS 22	3.211*	261	2.4%
CS 24	4.70	0	0.0%
CS 27	3.211*	48	0.4%
CS 28	3.211*	24	0.2%
CS 30	3.211*	6	0.1%
CS 31	3.211*	0	0.0%
CS 32	4.70	2	0.0%
CS 33	4.70	2	0.0%
CS 34	4.70	2	0.0%
CS 35	2.11	12	0.1%
CS 40	3.13	3,694	33.8%
CS 41	3.12	266	2.4%
CS 42	3.14	0	0.0%
CS 43	3.212*	216	2.0%
CS 44	3.10	0	0.0%
CS 80	3.212*	610	5.6%
CS 81	3.211*	0	0.0%
CS 82	3.212*	0	0.0%
CS 83	1.2	716	6.6%
CS 84	1.2	0	0.0%
CS 85	1.2	0	0.0%
CS 90	3.212*	6	0.1%
CS 91	3.212*	5	0.0%
CS 92	3.212*	1	0.0%
CS 93	2.33	1	0.0%
CS 94	2.32	2	0.0%
CS 95	2.35	1	0.0%
	Total:	10,920	100%

Summary of disposition codes			
AAPOR Code	**Description**	**Freq.**	**%**
N/A	**Total sample with final disposition**	**10,920**	**100.0%**
1.0	**Interview**	**1,075**	**9.8%**
1.1	Complete interview (I)	1,075	**9.8%**
1.2	Partial interview (P)	0	**0.0%**
2.0	**Eligible (but not-interviewed)**	**675**	**6.2%**
2.10	Refusal & break-off (R)	12	**0.1%**
2.11	Refusal	12	**0.1%**
2.12	Break-off (BO)	0	**0.0%**
2.20	Non-contact (NC)	659	**6.0%**
2.30	Other (O)	4	**0.0%**
3.0	**Unknown eligibility (not-interviewed)**	**5,202**	**47.6%**
3.10	Unknown if housing unit (UH)	3,960	**36.3%**
3.21	Housing Unit, but no screener completed (NS)	1,242	**11.4%**
3.211*	NS, but known that adult smoker in household (NS1)	339	**3.1%**
3.212*	NS, but unknown if adult smoker in household (NS2)	903	**8.3%**
4.0	**Not Eligible**	**3,252**	**29.8%**
	Multiple AAPOR codes (see corresponding colour in column C)	2,666	**24.4%**
4.70	No eligible respondent (NR)	586	**5.4%**

* AAPOR code created by DMC

Revised number of non-contacts (by accounting that some were not eligible)	
e1 x (CS10 + CS11)	**312**
e2 x (CS12 + CS13) = e2 x (NC - CS10 - CS11)	**178**
Revised non-contact (revNC)	**490**

Computed rates from disposition codes	
Eligibility rate (overall) e1 = (I + P + R)/(I + P + R + NR)	**65.0%**
Eligibility rate (after completion of screener) e2 = 1 - (CS32 + CS33 + CS34)/(I + P + BO)	**99.4%**
Estimated proportion of household (vs. commercial) phone numbers e3 = 1- (4.42* + 4.50*)/(I + P + R + NC + O + UH + NS + NR + 4.42* + 4.50*)	**95.7%**
Cooperation rate (AAPOR COOP4) COOP4 = (I + P)/(I + P + R)	**98.9%**
Response rate (AAPOR RR4) RR4 = (I + P)/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	**21.6%**
Response rate (excluding Other = 2.30*) RR4 = (I + P)/(I + P + R + revNC + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	**21.7%**
Refusal rate (AAPOR3) REF3 = R/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	**0.2%**
Non-contact rate (1 - AAPOR CON2) 1 - CON2 = 1 - (I + P + R + O)/(I + P + R + revNC + O + (e1 x NS2 + e2 x NS1 + e1 x e3 x UH))	**78.0%**

* These are AAPOR codes 2.30, 4.42 and 4.50; not numbers.

For more information on AAPOR consult http://www.aapor.org

Appendix A: Country Profile

Brazil has had an active tobacco control community operating over the past 25 years to protect the Brazilian public from the harms of smoking, and working to encourage policymakers to implement comprehensive tobacco control policies. The National Program on Tobacco Control was created in 1989 by the Ministry of Health to promote smoke-free environments and to implement smoking cessation programming. While playing a global leadership role in the development of the World Health Organization's first public health treaty, the Framework Convention on Tobacco Control (FCTC), on the home front Brazil created the National Commission for FCTC Implementation (CONICQ) which convened representatives from 18 different sectors of the Federal Government to ensure that all aspects of Brazilian government were considered in implementing the FCTC and its national tobacco control policies. Brazil ratified the FCTC in 2005 and has continued to implement policies that meet the obligations of the treaty since then.

Smoking Prevalence

Brazil is the largest country in South America, with a population of approximately 200 million (2013). Smoking prevalence in Brazil, which reached its height in the 1980's, has significantly decreased over the past two decades in conjunction with the implementation of effective initiatives to curb smoking. National surveys conducted in 1989, 2003, and 2008 (adjusted for sampling differences), show a decrease in smoked tobacco use of nearly one half -- from 34.8% in 1989, to 22.4 % in 2003, and to 18.2% in 2008 in adults 18 years and older.[1],[2] The rate of decline between 1989 and 2008 was relatively larger for younger age groups, and for those with over 9 years of education, but relatively similar across genders.[3] More recent Ministry of Health surveys conducted in Brazilian capital cities and the federal district (a total of 27 cities) report a continuing decline in smoking prevalence in adults over 18 years from 16.2% in 2006 to 14.8% in 2011. These surveys were also in alignment with the national surveys by reporting higher prevalence rates in males, smokers with 8 or less years of education, and smokers in the southern tobacco growing region of Brazil.

[1] Monteiro, C.M., Cavalcante, T.M., Moura, E.C., Claro, R.M., & Szwarcwald, C.L. (2007). Population-based evidence of a strong decline in the prevalence of smokers in Brazil (1989 – 2003). *Bulletin of the World Health Organization*, 85 (7), 527 – 534.

[2] Brazilian National Cancer Institute. (2010). Global Adult Tobacco Survey: Brazil report. Brazilian National Cancer Institute, Ministry of Health; Rio de Janeiro, RJ, Brazil. Available at: http://www.who.int/tobacco/surveillance/en_tfi_gats_2010_brazil.pdf.

[3] Szklo, A.S., de Almeida, L.M., Figueriedo, V.C., Autran, M., Malto, D.,Caizeta, R., Szklo, M. (2012). A snapshot of the striking decrease in cigarette smoking prevalence in Brazil between 1989 and 2008. *Preventative Medicine,* (54), 162-167.

Tobacco Control Policies

Packaging and Labelling

Prior to ratifying the FCTC in 2005, Brazil had implemented packaging and labelling provisions that in some cases surpassed the minimal requirements of the FCTC. Brazil was the first country to remove misleading descriptors like “light” and “mild” from cigarette packages in 2001. In the same year, Brazil introduced its first round of pictorial health warnings, covering 100% of either the front or back of the package. This set of nine warnings was circulated from 2001 to 2004, and a second set was circulated from 2004 to 2008. The most recent third set, put into public circulation in August 2009, depicts vivid and emotionally arousing images that were created based on research in the neurobiology of emotion showing that stimuli that are very negative, and high in arousal, cause an avoidance response.

Smoke-free Public Places

Workplace smoke-free legislation was first addressed in Brazil in 1988 with recommendations to develop restraining measures and designated smoking areas. Legislation in 1996 banned smoking in public places and on public transportation, but unfortunately lacked enforcement and still allowed for designated smoking areas. Successful regional smoke-free initiatives were implemented in individual states such as São Paulo and Rio de Janeiro, and municipalities such as Porto Alegre. A national smoke-free law was passed in December 2011, but has not yet been regulated and therefore is not in full force.

Tobacco Advertising, Promotion, and Sponsorship

Tobacco advertising and promotion was addressed through the Constitution of Brazil in 1988, where it suggested warnings should accompany tobacco advertisements. A law implemented in 1990 banned mischievous and abusive advertising, and an inter-ministerial ordinance in 1995 recommended that TV stations avoid broadcasting images of known personalities smoking. Fairly comprehensive restrictions on advertising and promotion were implemented in 2000, allowing only for advertising at point of sale. Bans on tobacco sponsorship of national sporting and cultural events were implemented in 2003, with international events given a reprieve until 2005.

Cessation

In the area of cessation and treatment, Brazil created a national toll-free telephone cessation counselling service in 2001 and signed the ordinance to create a national, publicly-funded

cessation program in August 2002. By 2004, smoker treatment centers were implemented within the primary care system to offer free access to a cognitive-behavioral approach and drug therapy for smokers, including free nicotine replacement therapies.

Price and Taxation

An ad valorem tax for cigarettes was first introduced in 1990 at 41.3% of the retail price. In 1999 Brazil introduced a multi-tiered specific excise tax which was levied based on the length of the cigarette and the style of packaging (hard pack or soft). Under this system and due to inflation the real price of cigarettes declined, as did revenue from tax collection[4]. In 2003, the government implemented a significant increase on tobacco excise taxes, and again in 2007 and 2009 so that overall the tax rate was 61% of the retail price.[5] In December 2011 a new tax structure was decreed with implementation scheduled for March 2012. This law laid out a plan to increase tax rates over four years to a cumulative adjustment of 55%, and allowed the government to set a minimum retail price for a pack of cigarettes.

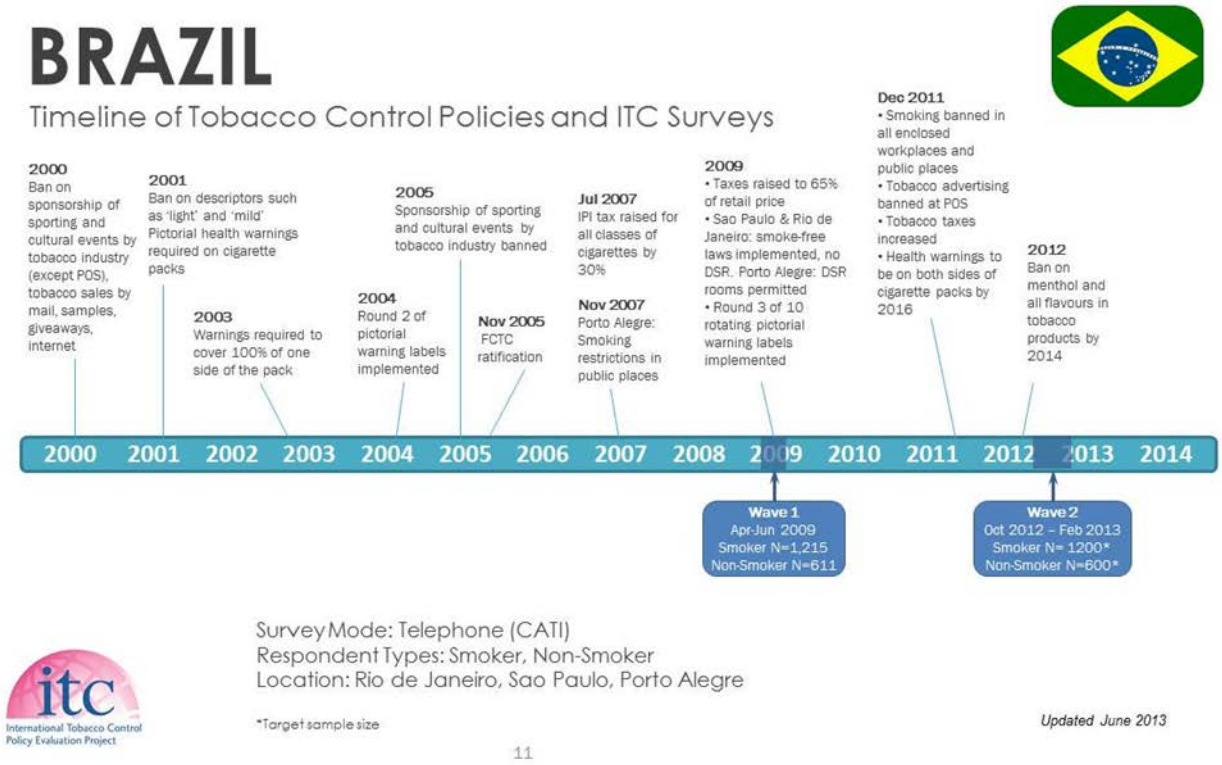
Corporate Social Responsibility

Brazil has established itself as one of the major tobacco manufacturing countries in the world over the past 15 years, and is considered an important economic factor in some regions in Brazil. However, as public perception shifts to view tobacco use as being harmful, tobacco companies such as Souza Cruz, a subsidiary of British American Tobacco that controls about 61% of the market share, and Philip Morris, with about 11% of the market share, have increased their participation in Corporate Social Responsibility (CSR) initiatives, which are intended to suggest to the public that the company is doing 'good things for the community' and thereby deflect from the reality of the harm caused by their products.

[4] Inglesias, R., Jha, P., Pinto, M., Da Costa e Silva, V.L., & Godinho, J. (2007) *Tobacco Control in Brazil*. Washington, DC, The International Bank of Reconstruction and Development/The World Bank.

[5] Sunley, E.M. (2009). Taxation of Cigarettes in the Bloomberg Initiative Countries: Overview of Policy Issues and Proposals for Reform. The International Union Against Tuberculosis and Lung Disease.

Appendix B: Brazil Policy Timeline



Sampling Design and Weight Construction for the International Tobacco Control (ITC) Brazil Survey

C. Boudreau[1,2] and M.E. Thompson[1,2]

Jul. 2013 (Waves 1–2)

This technical report details the sampling design and weight construction for waves 1 and 2 of the International Tobacco Control (ITC) Brazil Survey. The ITC Brazil Survey is a prospective longitudinal survey of a representative random sample of adults smokers and non-smokers residing in São Paulo, Rio de Janeiro and Porto Alegre.

This technical report is organized as follows: Section 1 describes the sampling design of the ITC Brazil Survey, and section 2 details the construction of the sampling weights for wave 1 (section 2.2) and wave 2 (section 2.3),

1 Sampling design

The ITC Brazil Survey is a prospective longitudinal study, and its sampling design was chosen to yield representative random samples of adult smokers and non-smokers residing in São Paulo, Rio de Janeiro and Porto Alegre. Hence, the ITC Brazil Survey is not representative of the entire Brazilian population, but of those living in the above mentioned 3 cities. Respondents were first interviewed in Apr.–Jun. 2009 (wave 1), with follow-up interviews in Oct. 2012–Feb. 2013 (wave 2). Those lost to follow-up at wave 2 were replenished by new randomly selected respondents. All interviews were conducted using computer assisted telephone interviews (CATI).

To qualify for the study, respondents must be 18 years old or more, and residing in one of the above mentioned 3 cities. Those that have smoked more than 100 cigarettes in their life and smoked at least once in the 30 days prior to recruitment were considered to be smokers, whereas the others were considered to be non-smokers.

[1]Dept. of Statistics & Actuarial Science, University of Waterloo, Waterloo, Ontario, N2L 3G1
[2]Data Management Core (DMC) — ITC Project, University of Waterloo

1.1 Wave 1

Within each of the 3 cities, households were randomly called using systematic sampling from an electronic phone number directory until the planned 400 smokers and 200 non-smokers were interviewed. In households with multiple eligible respondents (this includes non-smokers residing with smokers when the corresponding quota was open), the Next Birthday method (Binson et al. (2000)) was used to select a single one. No substitution within household was allowed, except when it was known that the selected respondent would be absent for the entire fieldwork period. When the non-smoker quotas were closed, only households with one or more qualified smokers were deemed eligible.

Note that, unlike ITC Brazil which utilizes systematic sampling, the majority of ITC phone surveys utilize random digit dialling (RDD) as their sampling method. This departure from the usual RDD design is due to the fact that the Brazilian survey firm Expertise (http://site.expertise.net.br), who conducted fieldwork at waves 1 and 2, has extensive electronic phone number directories of the 3 cities constituting the ITC Brazil Survey (i.e., São Paulo, Rio de Janeiro and Porto Alegre). For each of these cities, Expertise's electronic directory has almost 100% coverage of phone numbers. It was thus more efficient to use these electronic directories as the sampling frame, than using an RDD frame.

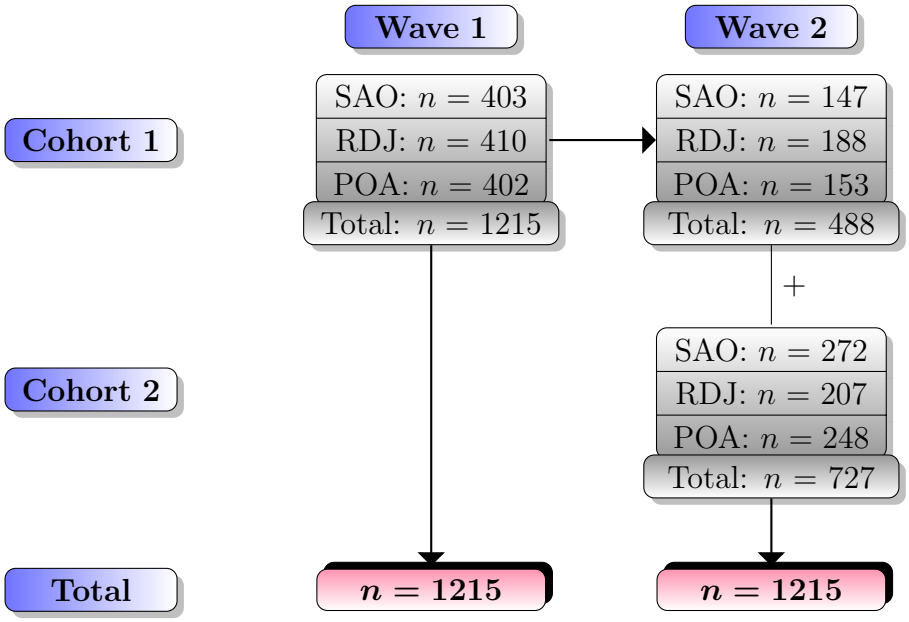
The ITC Brazil wave 1 sample consists of 1215 adult smokers and of 610 adult non-smokers, for a total of 1825 respondents; see figure 1.

1.2 Wave 2

Out of the 755 wave 1 respondents, 488 smokers and 267 non-smokers were successfully recontacted at wave 2; yielding a retention rate of 41.4% (40.2% for smokers and 43.8% for non-smokers). Note that of the 267 non-smokers recontacted, 7 had started smoking by wave 2. To compensate for the attrition, 1075 additional respondents (727 smokers and 348 non-smokers) were randomly sampled and interviewed; for a total of 1830 respondents interviewed at wave 2.

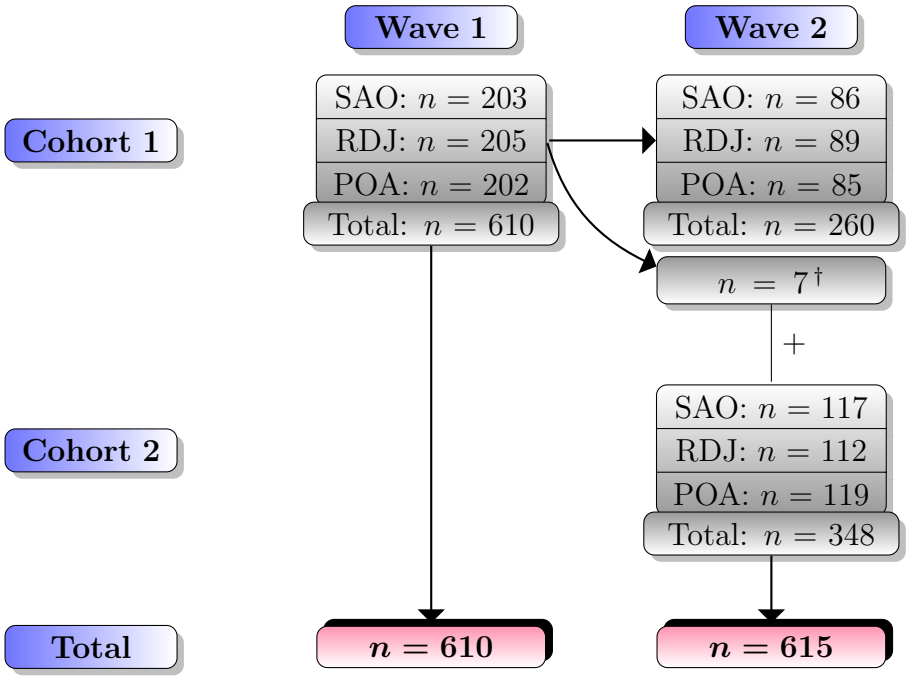
This sample of 1075 respondents is referred to as the wave 2 replenishment sample or cohort 2. As with other ITC surveys, replenishment for wave 2 of the ITC Brazil Survey was carried out using the same sampling design and interview protocol as in wave 1 (see section 1.1). Hence, the replenishment sample is representative of the population at the time of data collection (i.e., Oct. 2012–Feb. 2013), rather than those lost to follow-up/attrition. As in wave 1, fieldwork was conducted by the Brazilian survey firm Expertise.

Figure 1 show the attrition and replenishment of the ITC Brazil Survey sample over both waves.



SAO = São Paulo, RDJ = Rio de Janeiro, POA = Porto Alegre

(a) Smokers cohort



† Non-smokers who started smoking

(b) Non-smokers cohort

Figure 1: Attrition and replenishment in the ITC Brazil Survey.

2 Weight construction

2.1 General comments about weight construction

As with most survey weights, the ITC Brazil sampling weights are constructed to correct and adjust for sample mis-representation caused by unequal sampling probabilities, frame error (i.e., under-coverage and multiplicity) and non-response as well as improving precision of estimates through the use of auxiliary information (e.g., smoking prevalences). In addition, conservative weight trimming was performed to prevent extreme weight variation arising from a few respondents having very large sampling weights. We briefly describe these key concepts of weight construction in this section, but refer the reader to Levy & Lemeshow (2008), chapter 16, for more detailed information.

At their base, sampling weights are defined as the inverse of selection probabilities, and thus adjust for sample mis-representation caused by unequal sampling probabilities. For example, a smoker residing alone has a probability of selection twice that of a smoker residing with another smoker.

Great efforts are made to create a complete/perfect sampling frame (i.e., a frame that includes all members of the target population, without duplicate and without any erroneous inclusions[1]). However, this is seldomly achieved and, consequently, some members of the target population are not part of the sampling frame (i.e., have a 0 probability of being selected). This is referred to as frame under-coverage, and can result in non-coverage bias. To reduce non-coverage bias in the ITC Brazil Survey, post-stratification adjustments were performed on the sampling weights to ensure that, for each city/sex/age group, the totals of the sampling weights equal known benchmarks; see step 2 in section 2.2.1 for the smoker weights and step 2 in section 2.2.2 for the non-smoker weights. Note that these benchmark figures are also referred to as calibration or target figures, and thus this post-stratification adjustment is also referred to as weight calibration.

If non-respondents behave differently than respondents, then inference based solely on the sample of respondents will be biased unless adjustments are made. The greater the proportion of non-response, the greater this bias can be. In the ITC Brazil Survey, the post-stratification adjustment described in the above paragraph also adjust for coverage and non-response bias. It should be noted that if data are missing completely at random (MCAR, see Little & Rubin (2002)) within each city/sex/age group, then non-response bias will be completely eliminated. Realistically though, non-response bias is greatly reduced, but not eliminated in the ITC Brazil Survey.

The distribution of sampling weights is often skewed to the right, echoing the fact that most populations are composed of many average/typical members and of few atypical

[1] Erroneous inclusions refers to units that are not part of the target population, but included in the sampling frame.

ones. Average members have a fairly high probability of selection, and thus most sampling weights are fairly small. There are however few members of the population that have a much smaller probability of selection, and consequently have sampling weights that are quite large. These few large weights can be the source of high weight variation, which increases the variability of estimators and thus decreases precision. To correct for this, large weights are often trimmed in the weight construction process. This must be done with care and conservatively, as trimming can increase bias. There are various ways of trimming sampling weights. In the ITC Brazil Survey, trimming was done by capping the number of adults (and thus the number of smokers) in each household at 4 (see step 1 in section 2.2.1). Capping is a fairly conservative weight trimming technique and, since it is done at the beginning of weight construction, helps minimize potentially biasing estimates.

It is well known from survey sampling theory that, in the vast majority of cases, the ratio estimator has much greater precision than the commonly used Horvitz-Thompson estimator. Heuristically, this is due to the fact that the ratio estimator utilizes auxiliary (i.e., additional) information in addition to the sampling weights, whereas the Horvitz-Thompson estimator does not. As mentioned above however, smoking prevalence figures were used to calibrate the ITC Brazil sampling weights in order to reduce biases from frame errors and non-response. Our calibrating procedure yields the (so-called) ratio weights, which enable all estimators to inherit the increased precision of the ratio estimator.

All sampling weights for the ITC Brazil Survey were computed using the statistical software R (http://www.r-project.org).

2.2 Wave 1 weights

Two sets of weights were computed at wave 1:

i) Section 2.2.1 describes the computation of the **cross-sectional wave 1 weights for smokers** for the 1215 smokers who completed the wave 1 survey.

ii) Section 2.2.2 describes the computation of the **cross-sectional wave 1 weights for non-smokers** for the 610 non-smokers who completed the wave 1 survey.

Since no respondent can have both a smoker and non-smoker weight, both sets were combined into a single variable, labelled `aDE57915v`.

It should be noted that the smoker weights were calibrated to smoking prevalence (see step 2 of section 2.2.1) and rescaled to have a mean equal to 1 in each city (see step 3 of section 2.2.1). Similarly, the non-smoker weights were calibrated to non-smoking prevalence and rescaled to have a mean equal to 1 in each city. Consequently, these

weights should not be used to estimate population totals (e.g., the total number of daily smokers). However, all weights can obviously be used to estimate population means and proportions/percentages within city and smoking status, as well as in various statistical models (e.g., logistic and linear regressions).

2.2.1 Smoker weights

Computation of sampling weights for the 1215 smokers who completed the wave 1 survey proceeded as follows:

Step 1: Each respondent was assigned an initial weight $w_i^{(1)}$, which can be viewed as an adjustment for the probability of selection within a given household while the non-smoker quota was open and after it was closed. Formally, the $w_i^{(1)}$ weights are given by

$$w_i^{(1)} = \frac{\#\text{smokers}_i \times \#\text{adults}_i}{\hat{P}_i \times \#\text{smokers}_i + (1 - \hat{P}_i) \times \#\text{adults}_i}$$

where i stands for the i^{th} respondent, $\#\text{smokers}_i$ is the number of adult smokers in the household, $\#\text{adults}_i$ is the number of adults (i.e., 18 years and over) in the household, and $\hat{P}_i$ is an estimate of the probability that the household of the i^{th} respondent was called when the non-smoker quota was opened. Correspondingly, $1 - \hat{P}_i$ is an estimate of the probability that the household of the i^{th} respondent was called when the non-smoker quota was closed. Recall that $\#\text{adults}_i$ was capped at 4 to prevent large households from having undue influence on the weights (see section 2.1); thus, $\#\text{smokers}_i \leq \#\text{adults}_i \leq 4$.

In most ITC phone surveys, $\hat{P}_i$ is the same for all respondents. In the ITC Brazil Survey however, the non-smoker quota was temporally closed between May 2 and June 1, 2009. This was done to recruit more smokers before the introduction of new pictorial warning labels on cigarette packs on June 2, 2009 (though, a few small tobacco companies changed their cigarette packs before June 2). Hence, $\hat{P}_i = 0.22$ for respondents recruited before or on June 1, and $\hat{P}_i = 0.58$ for those recruited afterwards.

Computation of the $\hat{P}_i$'s: Let n_1 be the total number of households at which contact was made before or on June 1, and n_1^o be the number of households at which contact was made while the non-smoker quota was opened during that same period. Let n_2 and n_2^o be defined the same way as n_1 and n_1^o, but for the period starting on June 2. Note that n_1, n_1^o, n_2 and n_2^o are readily available from call-logs. Hence, for respondents contacted before or on June 1, $n_1^o/n_1 = 1723/7831 = 0.22$ is the probability that they were contacted while the non-smoker quota was opened. Similarity, for respondents recruited on June 2 or

later, $n_2^o/n_2 = 1347/2321 = 0.58$ is the probability that they were contacted while the non-smoker quota was opened for the 2nd time.

Note: In most ITC phone surveys, weights are adjusted to correct for frame multiplicity arising from households that have multiple residential phone lines (i.e., phone numbers, excluding cell phones and lines used for business calls, fax or Internet). To this end, each respondent is usually asked how many residential phone lines are connected to his/her household. Unfortunately, due to a small programming error, this information was not collected at wave 1 of the ITC Brazil Survey. Since the prevalence of households with multiple residential phone lines is relatively small in Brazil, the resulting bias in the sampling weights is negligible.

Step 2: A post-stratification adjustment was then performed to calibrate the $w_i^{(1)}$ weights to smoking prevalence by city/sex/age groups. To this end, age was first divided into 4 intervals (i.e., [18, 25), [25, 40), [40, 55) and [55, 100)); thus yielding the 24 city/sex/age cells of table A.1. For respondents in cell C_k, this post-stratification adjustment consisted in multiplying their $w_i^{(1)}$ weights by a factor c_k/t_k to produce calibrated $w_i^{(2)}$ weights. These $w_i^{(2)}$ weights are such that their sum over all respondents in cell C_k is equal to the estimated number of adult smokers in that cell. Formally,

$$w_i^{(2)} = w_i^{(1)} \times \frac{c_k}{t_k} = w_i^{(1)} \times \frac{c_k}{\sum_{i \in C_k} w_i^{(1)}}$$

where $c_1, \ldots, c_{24}$ are given in column 4 of table A.1 and C_k is the set of all respondents in cell k (where $k = 1, \ldots, 24$).

The calibration figures of table A.1 were obtained by combining population estimates for 2008 to prevalence estimates from the 2003 Brazilian National Household Survey; see appendix for further details.

Step 3: To facilitate comparisons between the 3 cities and with other ITC countries, the $w_i^{(2)}$ weights were rescaled to have a mean equal to 1 in each city. This yielded the $w_i^{(3)}$ weights, which are formally defined as

$$w_i^{(3)} = w_i^{(2)} \times \frac{n_c}{\sum_{i \in S_c} w_i^{(2)}}$$

where S_c is the set of all sampled smokers in city c, and n_c is the size of that sample; i.e.,

$$n_c = \begin{cases} 403 & \text{if } c = \text{São Paulo} \\ 410 & \text{if } c = \text{Rio de Janeiro} \\ 402 & \text{if } c = \text{Porto Alegre} \end{cases}$$

Hence, in each of the 3 cities, the $w_i^{(3)}$ weights sum to n_c.

Note: the coefficient of variation (cv) of the $w_i^{(3)}$ weights is 0.507.

2.2.2 Non-smoker weights

Computation of sampling weights for the 610 non-smokers who completed the wave 1 survey proceeded alike that for the smoker weights; i.e.,

Step 1: Each respondent was assigned an initial weight $w_i^{(1)}$, which can be viewed as an adjustment for the probability of selection within a given household while the non-smoker quota was open. Using the same notation as in step 1 of section 2.2.1, the $w_i^{(1)}$ weights are given by

$$w_i^{(1)} = \frac{\#\text{adults}_i}{\hat{P}_i}$$

where $\hat{P}_i = 0.22$ for respondents recruited before or on June 1 and $\hat{P}_i = 0.58$ for those recruited afterwards.

Step 2: The weights were then calibrated to non-smoking prevalence by city/sex/age groups. This was done the same way as step 2 of section 2.2.1 with the exception that the calibration figures for non-smokers (i.e., column 5 of table A.1) were used instead of those for smokers, and that two cells were collapsed because they contained too few respondents.

These non-smoking calibration figures were obtained by combining the same two surveys as in step 2 of section 2.2.1, and by simply taking 1 minus the smoking prevalence figure as the corresponding non-smoking prevalence figure.

Step 3: The weights were rescaled to have mean equal to 1 in each of the 3 cities. Formally,

$$w_i^{(3)} = w_i^{(2)} \times \frac{n_c}{\sum_{i \in S_c} w_i^{(2)}}$$

where $w_i^{(2)}$ is the weight of the i^{th} respondent computed in step 2 above, S_c is the set of all sampled non-smokers in city c, and n_c is the size of that sample; i.e.,

$$n_c = \begin{cases} 203 & \text{if } c = \text{São Paulo} \\ 205 & \text{if } c = \text{Rio de Janeiro} \\ 202 & \text{if } c = \text{Porto Alegre} \end{cases}$$

Hence, in each of the 3 cities, the $w_i^{(3)}$ weights sum to n_c.

Note: the coefficient of variation (cv) of the $w_i^{(3)}$ weights is 0.639.

2.3 Wave 2 weights

Six sets of weights were computed at wave 2.

Section 2.3.1 describes the computations of the smoker weights:

i) **Waves 1–2 longitudinal weights for smokers** were computed for the 488 smokers recruited at wave 1 that were retained and interviewed at wave 2. Note that 125 of these respondents had quit smoking at wave 2. Hence, if a respondent is recruited as a smoker, he/she will always be considered as a smoker when computing his/her longitudinal weights, regardless of his/her current smoking status.

ii) **Wave 2 cross-sectional smoker weights for cohort respondents** were computed for the 495 respondents that smoked (or had quit smoking) when interviewed at wave 2. These 495 respondents consist of the 488 cohort smokers mentioned above, and of 7 respondents that were recruited as non-smokers at wave 1, but started smoking by wave 2. Hence, if a respondent was recruited as a non-smoker, but had started smoking by wave 2, he/she will receive a cross-sectional smoker weight at wave 2. However, as with smokers, a respondent recruited as a non-smoker will always be considered as a non-smoker when computing his/her longitudinal weights, and that regardless of his/her current smoking status.

iii) **Wave 2 cross-sectional weights for new smokers** were computed for the 727 smokers recruited and interviewed at wave 2.

Section 2.3.2 describes the computations of the non-smoker weights:

iv) **Waves 1–2 longitudinal weights for non-smokers** were computed for the 267 respondents recruited as non-smokers at wave 1 that were retained and interviewed at waves 2. Note that 7 of these respondents had started smoking by wave 2; see ii above.

v) **Wave 2 cross-sectional non-smoker weights for cohort respondents** were computed for the 260 respondents recruited as non-smokers at wave 1 that completed the wave 2 survey and that had not started smoking at the time of wave 2 fieldwork. Hence, no wave 2 cross-sectional non-smoker weights for cohort respondents were computed for the 7 respondents that had started smoking by wave 2. Instead, wave 2 cross-sectional smoker weights for cohort respondents were computed for these 7 respondents; see ii above.

vi) **Wave 2 cross-sectional weights for new non-smokers** were computed for the 348 non-smokers recruited and interviewed at wave 2.

The two sets of longitudinal weights were constructed to adjust for attrition between waves 1 and 2, thus ensuring that the subset of respondents who completed both waves

still represents the population at the time of wave 1 (i.e., Apr.–Jun. 2009). Hence, these waves 1–2 longitudinal weights were calibrated using wave 1 figures (i.e., table A.1). The two sets of cross-sectional weights for cohort respondents were constructed for the same subset of respondents who completed both waves. However, new calibration figures (i.e., table A.2) were used to ensure that these respondents represent the population at the time of wave 2 (i.e., Oct. 2012–Feb. 2013). Lastly, cross-sectional weights were constructed for the new smokers and non-smokers recruited at wave 2.

Since no respondent can have both a smoker and a non-smoker longitudinal weights, both sets of longitudinal weights were combined into a single variable, labelled `bDE57921v`. Similarly, all four sets of cross-sectional weights were combined into a single variable, labelled `bDE57919v`. All ITC Brazil wave 2 weights were calibrated to smoking (or non-smoking) prevalence by city/sex/age group and rescaled to have a mean equal to 1 in each city. Consequently, these weights should not be used to estimate population totals (e.g., the total number of daily smokers); see section 2.2 for more details.

2.3.1 Smoker weights

Starting with $w_i^{(0)}$, the wave 1 smoker weight for the i^{th} respondent (computed in section 2.2.1), computation of the 488 **waves 1–2 longitudinal weights for smokers** proceeded as follows:

Step 1: The $w_i^{(0)}$ weights were re-calibrated to smoking prevalence by city/sex/age groups. This was done the same way as step 2 of section 2.2.1 and using the same prevalence figures (i.e., column 4 of table A.1), with the exception that the [18, 25) and [25, 40) age groups were collapsed into a single age group; see note at foot of table A.1. Collapsing was done because some city/sex/age groups contained to few respondents.

Step 2: The weights were then rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 147 for São Paulo, 188 for Rio de Janeiro and 153 for Porto Alegre.

Note: the coefficient of variation (cv) of the waves 1–2 longitudinal weights for smokers is 0.628.

Calculations of the 495 **wave 2 cross-sectional smoker weights for cohort respondents** proceeded as follows:

Step 1: Each respondent was assigned a starting weight $w_i^{(0)}$:

- if the i^{th} respondent was a smoker at wave 1, $w_i^{(0)}$ was taken to be his/her wave 1 smoker weight (computed in section 2.2.1);
- if the i^{th} respondent is one of the 7 respondents recruited as a non-smoker but had started smoking by wave 2, $w_i^{(0)}$ was taken to be the mean of the wave 1 smoker weights in the corresponding city/sex/age group.

Step 2: The weights were then calibrated to smoking prevalence by city/sex/age groups. This was done the same way as in step 2 of section 2.2.1, but using the updated figures given in table A.2 instead of those in table A.1. In addition, the [18, 25) and [25, 40) age groups were collapsed into a single age group; see note at foot of table A.2.

Step 3: Lastly, weights were rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 150 for São Paulo, 190 for Rio de Janeiro and 155 for Porto Alegre.

Note: the coefficient of variation (cv) of wave 2 cross-sectional smoker weights for cohort respondents is 0.631.

Computation of the 727 **wave 2 cross-sectional weights for new smokers** proceeded as follows:

Step 1: As in section 2.2.1, each respondent was assigned an initial weight $w_i^{(1)}$, which can be viewed as an adjustment for the probability of selection within a given household while the non-smoker quota was open and after it was closed. Formally, the $w_i^{(1)}$ weights are given by

$$w_i^{(1)} = \frac{\#\text{smokers}_i \times \#\text{adults}_i}{\hat{P}_i \times \#\text{smokers}_i + (1 - \hat{P}_i) \times \#\text{adults}_i}$$

where i stands for the i^{th} respondent, $\#\text{smokers}_i$ is the number of adult smokers in the household, $\#\text{adults}_i$ is the number of adults (i.e., 18 years and over) in the household, and $\hat{P}_i$ is an estimate of the probability that the household of the i^{th} respondent was called when the non-smoker quota was opened. Correspondingly, $1 - \hat{P}_i$ is an estimate of the probability that the household of the i^{th} respondent was called when the non-smoker quota was closed. Recall that $\#\text{adults}_i$ was capped at 4 to prevent large households from having undue influence on the weights (see section 2.1); thus, $\#\text{smokers}_i \leq \#\text{adults}_i \leq 4$.

Computation of the $\hat{P}_i$'s: there was no temporary closure of the non-smoker quotas at wave 2. Hence, unlike the $\hat{P}_i$'s at wave 1 (see section 2.2.1), the wave 2 $\hat{P}_i$'s do not depend on the date the i^{th} respondent was interviewed. However, fieldwork progress varied by city, and thus the wave 2 $\hat{P}_i$'s depend on the city of the i^{th} respondent. Using data from the wave 2 call-logs in combination with the method described in section 2.2.1,

$$\hat{P}_i = \begin{cases} 0.62 & \text{if } i^{\text{th}} \text{ respondent resides in São Paulo} \\ 0.49 & \text{if } i^{\text{th}} \text{ respondent resides in Rio de Janeiro} \\ 0.26 & \text{if } i^{\text{th}} \text{ respondent resides in Porto Alegre} \end{cases}$$

Step 2: The weights were then calibrated to smoking prevalence by city/sex/age groups. This was done the same way as in step 2 of section 2.2.1, with the exception that the wave 2 prevalence figures (see table A.2) were used instead of the wave 1 figures. In addition, the [18, 25) and [25, 40) age groups were collapsed into a single age group; see note at foot of table A.2.

Step 3: Lastly, weights were rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 272 for São Paulo, 207 for Rio de Janeiro and 248 for Porto Alegre.

Note: the coefficient of variation (cv) of the wave 2 cross-sectional weights for new smokers is 0.912.

2.3.2 Non-smoker weights

Starting with $w_i^{(0)}$, the wave 1 non-smoker weight for the i^{th} respondent (computed in section 2.2.2), computation of the 267 **waves 1–2 longitudinal weights for non-smokers** proceeded as follows:

Step 1: The $w_i^{(0)}$ weights were re-calibrated to non-smoking prevalence by city/sex/age groups. This was done the same way as step 2 of section 2.2.2 and using the same prevalence figures (i.e., column 5 of table A.1), with the exception that the [18, 25) and [25, 40) age groups were collapsed into a single age group, and that males aged [40, 55) and [55, 100) were collapsed into a single age group; see note at foot of table A.1. Collapsing was done because some city/sex/age groups contained to few respondents.

Step 2: The weights were then rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 89 for São Paulo, 91 for Rio de Janeiro and 87 for Porto Alegre.

Note: the coefficient of variation (cv) of the waves 1–2 longitudinal weights for non-smokers is 0.710.

Starting with $w_i^{(0)}$, the wave 1 non-smoker weight for the i^{th} respondent (computed in section 2.2.2), computation of the 260 **wave 2 cross-sectional non-smoker weights for cohort respondents** proceeded as follows:

Step 1: The weights were re-calibrated to non-smoking prevalence by city/sex/age groups. This was done the same way as in step 2 of section 2.2.2, but using the updated figures given in table A.2 instead of those in table A.1. In addition, the [18, 25) and [25, 40) age groups were collapsed into a single age group; see note at foot of table A.2.

Step 2: Lastly, weights were rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 86 for São Paulo, 89 for Rio de Janeiro and 85 for Porto Alegre.

Note: the coefficient of variation (cv) of wave 2 cross-sectional non-smoker weights for cohort respondents is 0.710.

Computation of the 348 **wave 2 cross-sectional weights for new non-smokers** proceeded as follows:

Step 1: As in section 2.2.2, each respondent was assigned an initial weight $w_i^{(1)}$, which can be viewed as an adjustment for the probability of selection within a given household while the non-smoker quota was open. Formally, the $w_i^{(1)}$ weights are given by

$$w_i^{(1)} = \frac{\#\text{adults}_i}{\hat{P}_i}$$

where i stands for the i^{th} respondent, $\#\text{adults}_i$ is the number of adults (i.e., 18 years and over) in the household, and $\hat{P}_i$ were given in section 2.3.1.

Step 2: The weights were then calibrated to non-smoking prevalence by city/sex/age groups. This was done the same way as in step 2 of section 2.2.2, with the exception that the wave 2 prevalence figures (see table A.2) were used instead of the wave 1 figures. In addition, the [18, 25) and [25, 40) age groups were collapsed into a single age group; see note at foot of table A.2.

Step 3: Lastly, weights were rescaled to have a mean equal to 1 in each city; same as step 3 of section 2.2.1, with the exception that n_c is equal to 117 for São Paulo, 112 for Rio de Janeiro and 119 for Porto Alegre.

Note: the coefficient of variation (cv) of the wave 2 cross-sectional weights for new smokers is 0.684.

Acknowledgements

Core funding for the ITC Project is provided by the U.S. National Cancer Institute (NCI) to the Roswell Park TTURC (P50 CA111236 & P01 CA138389), the Canadian Institutes of Health Research (CIHR; grants #79551 & #115016), and by the Ontario Institute for Cancer Research. Major funding for the ITC Brazil Survey provided by the Brazilian Secretaria Nacional de Políticas sobre Drogas (SENAD) and the Brazilian Instituto Nacional de Câncer (INCA), with support from the Alliance for the Control of Tobacco Use (ACTbr).

References

Binson, D., Canchola, J. A. & Catania, J. A. (2000), 'Random selection in a national telephone survey: a comparison of the kish, next-birthday and last-birthday methods', *Journal of Official Statistics* **16**, 53–60.

Levy, P. S. & Lemeshow, S. (2008), *Sampling of Populations: Methods and Applications*, 4 edn, John Wiley & Sons, Hoboken, NJ.

Little, R. J. A. & Rubin, D. B. (2002), *Statistical Analysis with Missing Data*, 2 edn, John Wiley & Sons, Hoboken, NJ.

Brazilian National Cancer Institute (2010), 'Global adult tobacco survey: Brazil report', http://www.who.int/tobacco/surveillance/en_tfi_gats_2010_brazil.pdf.

Instituto Brasileiro de Geografia e Estatìstica (2000), 'Censo Demográfico 2000', Rio de Janeiro, Brazil.

Instituto Brasileiro de Geografia e Estatìstica (2003), 'National Household Survey', Rio de Janeiro, Brazil.

Instituto Brasileiro de Geografia e Estatìstica (2008), 'Population estimates for 2008', http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/poprj.def.

Instituto Brasileiro de Geografia e Estatìstica (2010), 'Censo Demográfico 2010', Rio de Janeiro, Brazil.

Instituto Brasileiro de Geografia e Estatìstica (2012), 'Population estimates for 2012', http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/poprj.def.

Appendix: Benchmark/calibration figures

The estimated number of smokers and non-smokers given in table A.1 (next page) were obtained by combining population estimates from the Instituto Brasileiro de Geografia e Estatìstica (IBGE; Brazilian Institute of Geography and Statistics) to prevalence estimates from the 2003 Brazilian National Household Survey, which is also conducted by IBGE. To estimate the number of smokers, population estimates for a given city/sex/age group combination were simply multiplied by the smoking prevalence for the same city/sex/age group combination. Estimation of the number of non-smokers proceeded the same way, except that population estimates were multiplied by one minus the smoking prevalence of the corresponding city/sex/age group combination. The population estimates are for 2008, and are based on the 2000 Brazilian Census.

The estimated number of smokers and non-smokers given in table A.2 were obtained in a similar manner as for table A.1, but using population estimates (based on the 2010 Brazilian Census) for 2012 and smoking prevalence figures from the 2010 Global Adult Tobacco Survey: Brazil Report for table A.2.

City	Sex	Age	#smokers	#non-smokers
São Paulo	male	[18, 25)	128,410[a]	513,638[g]
	male	[25, 40)	277,956[a]	1,084,572[g]
	male	[40, 55)	327,369	632,657[h]
	male	[55, 100)	163,944	536,670[h]
	female	[18, 25)	81,648[b]	587,595[i]
	female	[25, 40)	324,219[b]	1,176,794[i]
	female	[40, 55)	222,939	914,506
	female	[55, 100)	133,113	867,733
Rio de Janeiro	male	[18, 25)	37,776[c]	290,712[j]
	male	[25, 40)	132,563[c]	576,331[j]
	male	[40, 55)	166,502	394,112[k]
	male	[55, 100)	92,175	392,957[k]
	female	[18, 25)	27,045[d]	306,848[ℓ]
	female	[25, 40)	132,562[d]	633,694[ℓ]
	female	[40, 55)	174,592	502,120
	female	[55, 100)	75,688	652,081
Porto Alegre	male	[18, 25)	24,000[e]	58,475[†,m]
	male	[25, 40)	51,506[e]	114,108[m]
	male	[40, 55)	42,360	87,182[n]
	male	[55, 100)	24,081	82,944[n]
	female	[18, 25)	21,282[f]	59,947[†,o]
	female	[25, 40)	41,892[f]	134,869[o]
	female	[40, 55)	48,349	110,173
	female	[55, 100)	23,208	144,965

Cells marked with † were collapsed when computing the wave 1 non-smoker weights.
Cells sharing the same letters (a, b, etc.) were collapsed when computing
the waves 1–2 longitudinal weights.

Table A.1: Estimated # of smokers and non-smokers, per city/sex/age group, used for calibration of the wave 1 weights and the waves 1–2 longitudinal weights.

City	Sex	Age	#smokers	#non-smokers
São Paulo	male	[18, 25)	110,928[a]	553,310[g]
	male	[25, 40)	286,473[a]	1,153,090[g]
	male	[40, 55)	286,091	754,239
	male	[55, 100)	144,278	644,126
	female	[18, 25)	67,844[b]	610,594[h]
	female	[25, 40)	214,587[b]	1,351,739[h]
	female	[40, 55)	240,265	967,099
	female	[55, 100)	116,323	1,002,171
Rio de Janeiro	male	[18, 25)	68,694[c]	281,788[i]
	male	[25, 40)	135,136[c]	615,620[i]
	male	[40, 55)	127,114	469,663
	male	[55, 100)	104,694	418,776
	female	[18, 25)	30,621[d]	321,339[j]
	female	[25, 40)	87,523[d]	722,872[j]
	female	[40, 55)	135,883	568,174
	female	[55, 100)	85,945	695,372
Porto Alegre	male	[18, 25)	20,869[e]	58,785[k]
	male	[25, 40)	41,699[e]	125,097[k]
	male	[40, 55)	37,726	91,916
	male	[55, 100)	20,757	94,559
	female	[18, 25)	11,097[f]	70,498[ℓ]
	female	[25, 40)	37,081[f]	142,923[ℓ]
	female	[40, 55)	37,131	120,873
	female	[55, 100)	23,600	155,188

Cells sharing the same letters (a, b, etc.) were collapsed when computing the wave 2 cross-sectional weights.

Table A.2: Estimated # of smokers and non-smokers, per city/sex/age group, used for calibration of the wave 2 weights.